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Characterization of Particulate Sources Influencing Monitoring Sites in Region VIII Non-Attainment Areas

PEDCo-Environmental Specialists, Inc, Cincinnati, Ohio

Prepared for

Environmental Protection Agency, Denver, Colo Air Planning and Operations Section

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CHARACTERIZATION OF PARTICULATE SOURCES INFLUENCING MONITORING SITES IN REGION VIII NON-ATTAINMENT AREAS

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION VIII

AIR & HAZARDOUS MATERIALS DIVISION

DENVER , COLORADO 80295

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Region VIII non-attainment particulate monitoring sites were examined to determine the nature of the sources most directly impacting them. A technique known as micro-inventorying was utilized. Trends in air quality at the sites were analyzed and the quality assurance procedures of the states reviewed. The report contains individual sections on 43 different sites. Photographics of most sites are included.

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PEDCo-ENVIRONMENTAL
SUITE 13 • ATKINSON SQUARE
CINCINNATI, OHIO 45246
513/771-4330

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Prepared by
PEDCo-ENVIRONMENTAL SPECIALISTS, INC.
Suite 13, Atkinson Square
Cincinnati, Ohio 45246

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EPA Project Officer: David Kircher

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June 1976

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i-b

CONTENTS

Page

1.0 INTRODUCTION 1-1

2.0 METHODOLOGY 2-1

2.1 Microinventories and Site Evaluations 2-1
2.2 Emission Estimates 2-3
2.3 Evaluation of Potential Emission Reductions 2-5
2.4 Microscopic Analysis 2-7

3.0 SITE EVALUATION DESCRIPTIONS 3-1

3.1 Adams City 3-3
3.2 Arvada 3-8
3.3 Aurora 3-13
3.4 Brighton 3-18
3.5 Denver-School Administration Building 3-23
3.6 Denver-CAMP 3-27
3.7 Denver-Gates Rubber Company 3-32
3.8 Denver-Wastewater Treatment Plant 3-36
3.9 Denver-C.A.R.I.H. 3-41
3.10 Englewood 3-46
3.11 Lakewood 3-51
3.12 Littleton 3-56
3.13 Longmont 3-61
3.14 Greeley-City Complex 3-66
3.15 Greeley-Wastewater Treatment Plant 3-71
3.16 Loveland 3-76
3.17 Sterling 3-80
3.18 Windsor 3-85
3.19 La Salle 3-90
3.20 Platteville 3-95
3.21 Colorado Springs 3-100
3.22 Pueblo-Fire Station 3-105
3.23 Pueblo-Health Department 3-110
3.24 Trinidad 3-115
3.25 Walsenburg 3-120
3.26 Steamboat Springs 3-125
3.27 Rifle 3-130
3.28 Grand Junction 3-135
3.29 Tract CB Trailer 020 3-139
3.30 Tract CB Trailer 022 3-144
3.31 Great Falls 3-149
3.32 Butte-Greeley School 3-154
3.33 Missoula-Courthouse 3-159

Page

3.34 Libby 3-164
3.35 Magna 3-169
3.36 Ogden-Health Department/NASN Station 3-174
3.37 Provo 3-179
3.38 Salt Lake City-Health Department/NASN Station 3-184
3.39 Salt Lake City-Airport 3-189
3.40 Rock Springs 3-194
3.41 Rapid City-Health Department 3-199
3.42 Rapid City-Ken Freize Enterprises 3-203
3.43 Rapid City-Cement Plant 3-207

4.0 SUMMARY 4-1

4.1 Reasons for Non-attainment in Region VIII 4-1
4.2 Need for Implementation Plan (SIP) Revisions 4-5
4.3 Observations on Air Quality Data 4-7
4.4 Relationship between Emission Densities and Air Quality 4-10

A APPENDIX A-1

REFERENCES R-1

FIGURES

No. Page

4-1 Relative Change in Measured TSP Concentration for Region VIII Sites, 1974 to 1975 4-8

4-2 Particulate Emission Density versus Measured Air Quality 4-11

TABLES

No. Page

1-1 Non-Attainment Particulate Sampling Sites in EPA Region VIII 1-3

2-1 Control Techniques for Selected Fugitive Dust Sources 2-6

2-2 Estimated Particulate Background 2-8

4-1 EPA Region VIII Non-Attainment Summary 4-2

1.0 INTRODUCTION

The preamble to the proposed regulations for submittal of AQMA plans specifies that the Administrator will notify the states by July 1, 1976 as to which state implementation plans (SIP's) are "substantially inadequate" to attain ambient air quality standards in particular ACQR's, and require that a plan revision be submitted for these identified areas by July 1, 1977 (with certain provisions for extensions). In EPA Region VIII, there are 43 suspended particulate sampling sites that are presently or have in the recent past recorded concentrations higher than the annual primary standard (75 ug/m^3).* Since almost all point sources are now in compliance with applicable SIP regulations, this would indicate that plan revisions may be required for the AQCR's in which these sampling sites are located.

Before making the determination of which AQCR's are substantially violating the particulate standards, the Regional Administrator desires to verify the air quality data on which the decisions will be based and to check that further reductions in ambient concentrations can be achieved by additional or more stringent control regulations. Recent area source emission inventories and AQMA analyses for particulates in all Region VIII states have shown that fugitive dust sources such as unpaved roads are major contributors to ambient concentrations; in many cases, these fugitive dust sources cannot be controlled to the extent necessary to attain the standards.

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* There may be a few additional sites in Region VIII which do not report data to SAROAD or which are classified as special studies' sites that measure average concentrations above 75 ug/m^3 but have not been included in this study.

This report contains a compilation of information and analysis of data for each of the non-attainment sites, presented in a format that will permit EPA to determine whether the recorded data are representative of actual air quality in the area of the sampling station and/or whether the sources contributing to the high concentrations are controllable. The 43 non-attainment sites that have been evaluated in this study are listed by state and AQCR in Table 1-1.

All of the non-attainment sites were surveyed during the months of March and April 1976, with the exception of those in South Dakota, which were completed in November, 1975. Detailed site-specific data were obtained which would enable the determination of the particulate sources having the greatest potential impact on measured values and permit the assessment of possible exposure biases. Photographs were taken of each site, historical air quality data were obtained from the appropriate state agencies, and detailed demographic, traffic, and localized development data were obtained. Emission estimates were then prepared for each site and correlated with air quality measurements.

Microscopic analysis of selected filters at all sampling sites was originally planned in order to provide a second means of estimating relative source impacts on the samplers' readings. However, the preliminary microscopy work revealed an inability to distinguish the source origin of most of the mineral material (fugitive dust) on the filters. Since this mineral fraction constituted 70 to 90 percent of the material on most of the filters, microscopy usually did not provide any significant additional information

Table 1-1. NON-ATTAINMENT PARTICULATE SAMPLING SITES IN EPA REGION VIII

State	AQCR	Site
Colorado	Denver	Adams City
		Arvada
		Aurora
		Brighton
		School Administration Building
		CAMP
		Gates Rubber Company
		Wastewater Treatment Plant
		C.A.R.I.H
		Englewood
		Lakewood
		Littleton
		Longmont
	Pawnee	Greeley-City Complex
		Greeley-Wastewater Treatment Plant
		Loveland
		Sterling
		Windsor
		La Salle
		Platteville
	San Isabel	Colorado Springs
		Pueblo-Fire Station
		Pueblo-Health Department
		Trinidad
		Walsenburg
	Yampa	Steamboat Springs
	Grand Mesa	Rifle
		Grand Junction
		Tract CB Trailer 020
		Tract CB Trailer 022
Montana	Great Falls	Great Falls
	Helena	Butte
	Missoula	Missoula
		Libby
Utah	Wasatch Front	Magna
		Ogden-Health Department/NASN
		Provo
		Salt Lake City-Health Department/NASN
		Salt Lake City-Airport
Wyoming	Wyoming	Rock Springs
South Dakota	Black Hills	County Health Department
		Ken Freize Enterprises
		South Dakota Cement Plant

as to the origin of the material. Therefore, results of the microscopic analyses were concluded to be of limited value to this study and are not included herein.

Chapter 2 details the methodologies employed for the assemblage of data, preparation of emission estimates, site evaluations and quality assurance evaluations, microscopic investigations of filter pads, and presentation of data.

Chapter 3 presents, by each individual non-attainment site, a five page data summary including: (1) detailed site description and a graph of historical trends in air quality; (2) photographs of sampler location and surrounding area; (3) map showing sampler locations, one mile radius, and major sources; (4) summary of emissions; and (5) the meteorological data for that location and site summary and evaluation. The meteorological data were obtained from the nearest National Weather Service station.

Chapter 4 presents an overview discussion of particulate non-attainment in EPA Region VIII, based on summaries of the individual site evaluations. Overall findings by AQCR are presented, including emission density versus air quality relationships, trends in measured air quality, probable reasons for individual site and AQCR-wide non-attainment of standards, and representativeness of data from regional sampling networks.

2.0 METHODOLOGY

2.1 MICROINVENTORIES AND SITE EVALUATIONS

Each of the high volume particulate sampling stations listed in Table 1-1 was visited and the area within a one mile radius of the site surveyed to identify all particulate sources possibly impacting on the sampler which may form a component of the measured particulate concentration. This "microinventory" technique was developed by PEDCo and has been applied to similar investigations in EPA Regions VII and IX. It has served as the prime basis for development of an emission density versus air quality relationship from which air quality could be predicted in areas otherwise not suitable for utilization of conventional dispersion modeling techniques. The procedure has demonstrated reasonably good accuracy and reproducibility in correlating quantified estimates of source emission strength with measured air quality.

The survey procedure employed to provide the best observation of overall site exposure was to ground survey, via automobile, the sampler stations and all probable sources of emissions within a one mile radius of each sampling site to identify the sources with primary impact on the samplers. Sources of fugitive dust and conventional point and area sources were located on the appropriate USGS 7.5 minute quadrangle map and labeled with pertinent data, such as size and boundaries, observed activity and operational characteristics, estimated emission rate, and any other important parameters. Two observers independently estimated and agreed upon parameters observed at each site to increase accuracy and completeness.

Large point sources outside the one mile radius were also located if it was possible that they might contribute to measured particulate loading. The site locations and surrounding one mile radius survey areas are illustrated on the second page of each site data summary in Chapter 3. All point sources within 1/4 mile of the sampler are indicated on these site maps regardless of their emission rate. From a 1/4 mile to 1 mile radius, those sources emitting greater than 25 ton/yr are shown. Beyond the 1 mile radius, only those sources emitting greater than 100 ton/yr are shown. Power plants are shown irrespective of their emission rates or siting relative to the sampler.

While the survey team was at each site, PEDCo staff also completed site description forms designed to evaluate the exposure of the sampling locations and identify any problems with representativeness or validity of the high volume sampler data. The sampler site and immediate surrounding area (300 feet radius) were subjectively judged with respect to adequacy of physical placement and potential for physical or localized pollution interferences, land rise of surroundings and terrain features, and the probability of obtaining a representative sample of ambient air given the existing siting conditions. The survey form used for this site description evaluation is included in Appendix A.

The field team also contacted cognizant state and local agency personnel to assess sample handling and quality assurance procedures employed by operators and laboratories responsible for each site. The information acquired included both qualitative and quantitative data regarding operator performance in high volume sampler calibration, recording of applicable data, and sample handling, packaging, and mailing. To ensure that proper laboratory procedures were employed in each case, information on filter specifications, filter inspection, weighing and marking, and balance calibration was obtained. The completed survey forms used for this quality assurance check are also included in Appendix A.

Finally, two photographs illustrating the sampler, viewed in the directions where the greatest potential for localized pollution influence existed, were obtained for every site except seven that were completely inaccessible to the survey team (School Administration Building and Gates Rubber Company in Denver, Loveland, Grand Junction, and three in Rapid City--Health Department, Ken Freize Enterprises, and South Dakota Cement Plant). These photographs are the second page of each site data summary in Chapter 3.

2.2 EMISSION ESTIMATES

The survey data were converted into estimates of particulate emission density (ton/sq mi/yr) within the 3.14 square mile area (circle of 1 mile radius) by a three-step procedure. First, all identified fugitive dust sources within each site area were listed and estimates of size in terms of emission parameters were made. Next, appropriate emission factors were applied to each source to calculate estimated annual emissions. Third, conventional area and point source emissions were added to get total particulate emissions in each survey area.

The emissions associated with each site are presented in a table in each site data summary in Chapter 3. Shown also are the emission factors for the fugitive dust sources. Variations in these factors between AQCR's are accounted for by differences in climate of the various geographic areas, i.e., wind speed, soil erosion parameters, and precipitation-evaporation indices. Appropriate methodologies for development of each factor were obtained from Compilation of Air

Pollutant Emission Factors, Supplement 5,[1] and from Development of Emission Factors for Fugitive Dust Sources.[2]

Conventional area source emissions in the microinventory areas were not estimated by emission factors, but as a percentage of the respective total county emissions calculated for the categories included in the appropriate current area source inventory. The categories were condensed, for summary purposes, into four general categories: fuel combustion, incineration, other mobile, (off-highway vehicles, aircraft, locomotives, and vessels) and motor vehicle exhaust (on-highway gasoline and diesel automobiles and trucks). The percentage of county emissions occurring in the area was assumed to be the same as the percentage of the county's population (or VMT for motor vehicle exhaust) contained in the microinventory areas. This necessitated the collection and generation of some demographic data (i.e., population, employment, vehicle miles traveled) for each survey area.

Current state or NEDS point source inventories were the reference for emission data for point sources. Small point sources not included in point source listings were evaluated from the size and activity parameters obtained during the surveys together with emission factors keyed to these parameters. All of the point sources included on the site emission data summaries in Chapter 3 may not be located on the maps, due to the emission rate and distance from sampler criteria that were detailed in the preceding section of this chapter. Additionally, all point sources located outside of the one mile radius survey area were not included in the calculation of emission density for the area.

Assuming then that particulate emissions in the site survey areas are, in fact, directly proportional to air quality measured therein, the 1975 annual geometric mean concentration for each sampler and corresponding emission density were plotted by AQCR (Figure 4-2). Using the valid data points, linear regression analyses were performed to determine the lines of best fit, which resulted in a "background" concentration from 39 to 68 ug/m^3 (zero emission density) and correlation coefficients ranging from 0.60 to 0.80. An emission density of approximately 200 ton/sq mi/yr was shown to be equivalent to 75 ug/m^3 annual geometric mean.

2.3 EVALUATION OF POTENTIAL EMISSION REDUCTIONS

In order to determine which of the contributing sources at the non-attainment sites were most amenable to emission reductions and whether reductions sufficient to bring about attainment of the primary standards could reasonably be expected, the sources were considered under three separate categories--point sources, area sources, and fugitive dust sources. For point sources, NEDS printouts and state emission inventory summaries were checked to find the compliance status of each source and what regulation was applied to determine allowable emissions. Where the source was not in compliance or the applicable regulation represented less than reasonably available control technology, note was made of the potential for emission reductions.

It was assumed that no emission reductions could be obtained from conventional area sources. Fuel combustion in Region VIII states is already almost exclusively natural gas, incineration emissions were negligible in most of the survey areas, off-highway vehicles offer little opportunity for control, and motor vehicle emissions are under federal jurisdiction.

Fugitive dust sources are often uncontrolled at present and therefore provide the greatest potential for significant emission reductions. Approximate control efficiencies for several types of fugitive dust sources are shown in Table 2-1. However, these controls are not necessarily "reasonable

Table 2-1. CONTROL TECHNIQUES FOR SELECTED FUGITIVE DUST SOURCES

Source	Practicality of regulation[a]	Control Method	Control efficiency
Unpaved roads	2-3	Paving and right-of-way improvement	85%
	4	Surface treatment with penetration chemicals	50%
	3	Soil stabilization chemicals worked into the roadbed	50%
	1-2	Speed control	25-40%
Construction activity	1-2	Watering	50%
	2	Chemical stabilization of completed cuts and fills	80%
	3	Treatment of temporary access and haul roads on or adjacent to site	50%
		Minimal exposure periods (controlled by permit; good practice with watering or chemical stabilization)	
Agriculture	3	Continuous cropping	25%
	3	Limited irrigation of fallow fields	20%
	5	Windbreaks	5%
	5	Inter-row plantings of grain on widely spaced row crops	15%
	5	Stubble, crop residue, or mulch left on fields after harvest for wind protection	10%
	5	Spray-on chemical stabilization	40%
Tailings piles	2	Chemical stabilization	80%
	2-3	Vegetation	65%
	2	Combined chemical-vegetative stabilization	90%
Aggregate storage	2	Continuous spray of chemical on material going on storage piles	90%
	1-2	Watering of haul roads and storage areas	50%
	3	Treatment of haul roads and traffic areas	50%
	2	Watering (sprinklers or truck)	80%

[a] 1 = excellent, 2 = good, 3 = fair, 4 = poor, 5 = not recommended

Source: Investigation of Fugitive Dust--Sources, Emissions and Control, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, Publication Number EPA 450/3-74-036, 1974.

techniques" because of the large number of sources to which they would have to be applied on a county- or AQCR-wide basis.

Potential reductions in emissions in each study area were estimated to produce proportional changes in the portion of the ambient concentration (annual mean) above background, or that portion supposedly affected by the emissions. Values used for background in each AQCR are shown in Table 2-2. These values were estimated from nonurban sites in the AQCR unaffected by nearby emission sources, from y-intercepts of emission density versus air quality curves, or from modeling analyses performed in these areas. The calculations of potential emission reductions and air quality associated with such reductions have not been shown because of the many assumptions and approximations involved in determining reasonable control measures for both point sources and fugitive dust sources.

2.4 MICROSCOPIC ANALYSIS

Strips of exposed high volume filters could not be viewed directly under the polarized light microscope because of particle agglomeration on the surface of the filter. Therefore, particles were resuspended and dispersed in water in a sonic cleaner and then recollected on a Millipore filter. A wedge of the Millipore filter was then placed on a slide and the filter material cleared with a solution of dimethyl phthalate/diethyl oxylate. Particles on the slide were identified as to origin, counted, and their sizes estimated using a calibrated Porton reticule at a total magnification of 100 power. Based on particle counts and estimated densities (a function of suspected particle origin), the percent by weight of the major components was calculated.

Table 2-2. ESTIMATED PARTICULATE BACKGROUND CONCENTRATIONS

AQCR	Estimated background concentration, ug/m^3
Denver	40-45
Pawnee	45
San Isabel	
Colorado Springs	30-35
Pueblo	45
Other sites	40-45
Yampa	20
Grand Mesa	40
Great Falls	20-25
Helena	25
Missoula	38
Wasatch Front	40
Wyoming	28-35
Black Hills	30-35

Published descriptions and photomicrographs of particle types plus samples of soil and fine material from ground-level sources were used as references for determining particle origins. Personnel performing the microscopy were experienced in characterization of particulate matter.

Prior to proceeding with microscopic examination of high volume filters from each site, some quality control work was done first to determine the accuracy of microscopic identification of particulate composition and origin. Results of the quality control evaluation showed that the particle count by size range for any five fields under the microscope is ± 52 percent of the true value for mineral matter and ± 44 percent for combustion products. Of this total variability, differences in counts by different analysts account for one-third of the error, differences in the fields selected account for 21 percent of the error, and differences in the cores cut from the sample account for 46 percent (as a result of nonhomogeneous impaction on the filter).

However, a more important problem surfaced during this quality control work. Even with the polarized light microscope and experienced analysts, it was not possible to subdivide the mineral fraction (fugitive dust) into any detailed source categories, such as reentrained dust from streets, construction dust, or naturally-occurring material from wind erosion. Since the mineral fraction was 70-90 percent of the total particles on most slides, the microscopy results in most cases did not provide any significant additional information as to the origin of the material collected on the filters and were not included in the individual site evaluations.

3.0 SITE EVALUATIONS

The purposes of the visit to each non-attainment site and inspection of the sampler's exposure were to determine: (1) whether the readings accurately reflect particulate concentrations in the vicinity of the sampler; and (2) whether the sources contributing to the high ambient concentrations could reasonably be further controlled by passing new or more stringent regulations. The site evaluations presented in this chapter attempt to correlate all the available information on each site and identify specific reasons for non-attainment. This discussion is presented in the Summary and Conclusions section of every site evaluation package, which follows the site description, photographs, map, and emission inventory.

Broader conclusions relative to predominant sources in non-attainment areas, common reasons for non-attainment, the need for SIP revisions in AQCR's with one or more samplers violating the standards, short-term versus annual average violations, etc., are discussed in Chapter 4 by compiling the findings of the individual site evaluations.

The 43 site evaluations presented here involve 11 different AQCR's in five states. The sites are listed by AQCR in Table 1-1. It should be noted that 13 of the 43 sites surveyed are in the Denver AQCR and that 25 of the non-attainment sites in Region VIII are in the three Colorado Front Range AQCR's of Denver, Pawnee, and San Isabel. The site evaluation package for a specific site can be accessed most rapidly by referring to the Table of Contents.

Two of the sites surveyed and evaluated, Tract CB sites 020 and 022 in Grand Mesa AQCR, do not have any recent reported concentrations above the primary standards. They were included because concentrations above the 24-hour secondary standard of 150 ug/m^3 were reported for the sites, even though they were established as baseline or background stations. The purpose of the on-site surveys at these locations was to determine whether background particulate levels in arid parts of Region VIII might occasionally exceed the short-term secondary standard. Alternatively, the sites could be influenced by nearby open sources.

3.1 ADAMS CITY - TRI-COUNTY HEALTH DEPARTMENT
SAROAD Site No. 06-0020-001

Description

General site description - The sampler is located on the roof of the Tri-County Health Department (4301 East 72nd) about 15 feet above ground level. It is about 100 feet back from the road in a light commercial/residential area.

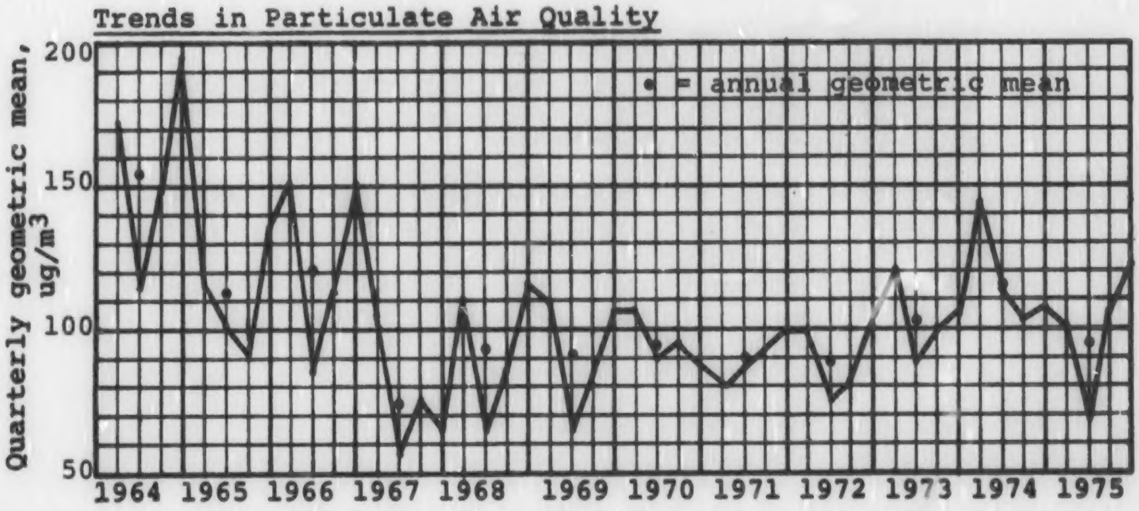
Localized pollution influences - The sampler is bordered on two sides by a large paved parking lot that is relatively clean. There are large unpaved parking lots 300 feet to the northwest and northeast and a small cleared area 500 feet to the northeast. Also, the County Highway Department has a small sand and gravel operation approximately 600 feet north of the sampler. There are about 4 roof vents and an air conditioning compressor about 50 feet from the sampler, but these do not appear capable of affecting the readings.

Physical interferences - No major obstructions were noted in the immediate vicinity of the sampler. There were few other buildings within 500 feet and none taller.

Terrain - The site area is relatively flat and comprised of open land to the north and west with several large highways cutting through the area.

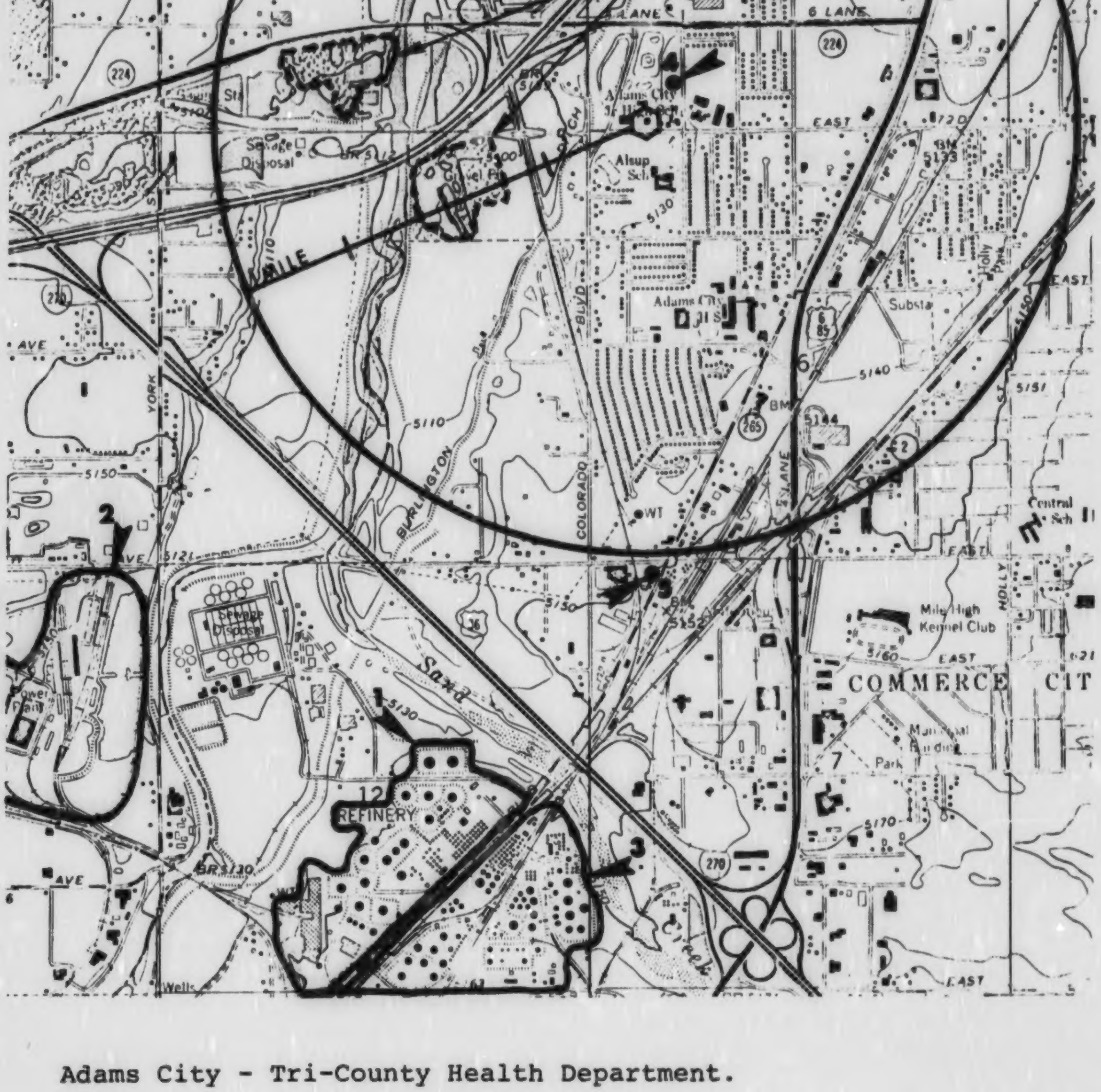
Comments - The site has a reasonable suburban exposure, but is probably not representative of ambient air in this area, which is characterized more by industrial land use. In its current position, the sampler is relatively isolated from impacts caused by industrial activity in Adams City. The streets in the area were sanded and dirty at the time of the survey.

Trends in Particulate Air Quality



Adams City sampler viewed to the north.

Adams City sampler viewed to the south.


Assumption Sch
Welby
76TH AVE
36
Well
SOUTH
PACIFIC
Gravel Pits
2 LANE
6 LANE
224
Sewage Disposal
Gravel Pit
MILE 1
Adams City
Alsup Sch
Adams City H S
Substa
COLORADO BLVD
BURLINGTON
YORK
HOLLYWOOD ST
EAST
5130
5110
5150
5140
Central Sch
Sewage Disposal
Power Plant
1
2
3
12
REFINERY
Mile High Kennel Club
COMMERCE CIT
Municipal Building
Park
7
Sand Creek
270

Adams City - Tri-County Health Department.

Sources in Microinventory Area (1 mile radius)

Adams City
Population = 2,250
VMT = 86,400

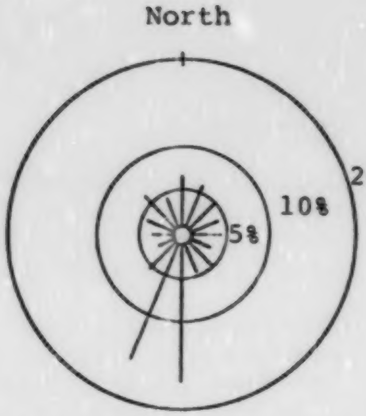
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Mack Precast Products			neg
Hungarian Flour Mill			unknown
Far Mar Company			12
1 Conoco	Outside mile radius		254
Denver Feeds			10
CPL Construction			neg
2 Cherokee Power Plant	Outside mile radius		925
Barnett Company			neg
Mobile Pre-Mix			2
Adams County Hwy Dept			unknown
3 Refinery Corporation	Outside mile radius		59
4 Kilgore Atchison			26
5 Kellogg Company			102
Colorado Milling/Elev			34
Area sources:			
Fuel combustion	From AQMA emission inventory report, 1.2% of county pop		8
Incineration			neg
Other mobile			1
Motor vehicle exhaust	86400 VMT/day	0.59 g/VMT	21
Fugitive dust sources:			
Unpaved roads	3.0 mi, 60 ADT	3.5 lb/VMT	115
Unpaved shoulders	8.1 mi	0.62 t/ac/yr	12
Paved roads	86400 VMT/day	3.5 g/VMT	122
Road sanding	From APCD analysis		104
Unpaved parking lots	56 ac	1.4 lb/VMT	32
Agriculture	52 ac	0.31 t/ac/yr	16
Cleared areas	77 ac	0.59 t/ac/yr	45
RR right-of-way	24 ac	0.7 t/ac/yr	17
Gravel pits/quarries	98 ac	10.3 t/ac/yr	1009
Playgrounds	10 ac	0.62 t/ac/yr	6
Total emissions, ton/yr			1694
Emission density, ton/sq mi/yr			539
Percent fugitive dust			87

Meteorological Data

Average annual
wind speed = 10.0 mph

Annual precipitation -
1974 = 14.03"
1975 = 15.51"
Normal = 15.51"

No. of days
with precipitation = 84



Stapleton Airport - 1% calm

Maximum Recorded Concentrations

1974 = 405 ug/m^3; 1975 = 255 ug/m^3

Summary and Conclusions

The Adams City site has been consistently over the primary standard for the past 12 years, with no definite downtrend in particulate concentrations in recent years. Seasonal variations have not been as pronounced at this site as at most others in the Denver area, probably because of the relatively low local influence of road sanding emissions. Major impacting sources were identified to be several nearby sand and gravel pits, unpaved roads, street dust, and possibly some large point sources just outside the one mile radius survey area. The estimated emission density in the survey area is quite high, tending to confirm the ambient measurements (116 ug/m^3 in 1974 and 96 ug/m^3 in 1975).

The sampler appears to be well located and free from local interferences. In fact, there are probably many industrial areas in Adams City where concentrations even higher than measured at the present sampling site could be recorded.

Since some of the sources and source categories contributing to the readings at this site appear to be further controllable (e.g., sand and gravel pits), increased enforcement effort or additional regulations could reduce emissions and improve air quality in the Adams City area.

3.2 ARVADA-GRANDVIEW AVENUE
SAROAD Site No. 06-0120-001

Description

General site description - The sampler is located on the roof of a building (7622 Grandview Avenue) about 10 feet above ground level and set back 20 feet from a paved parking lot. The surrounding area is primarily commercial.

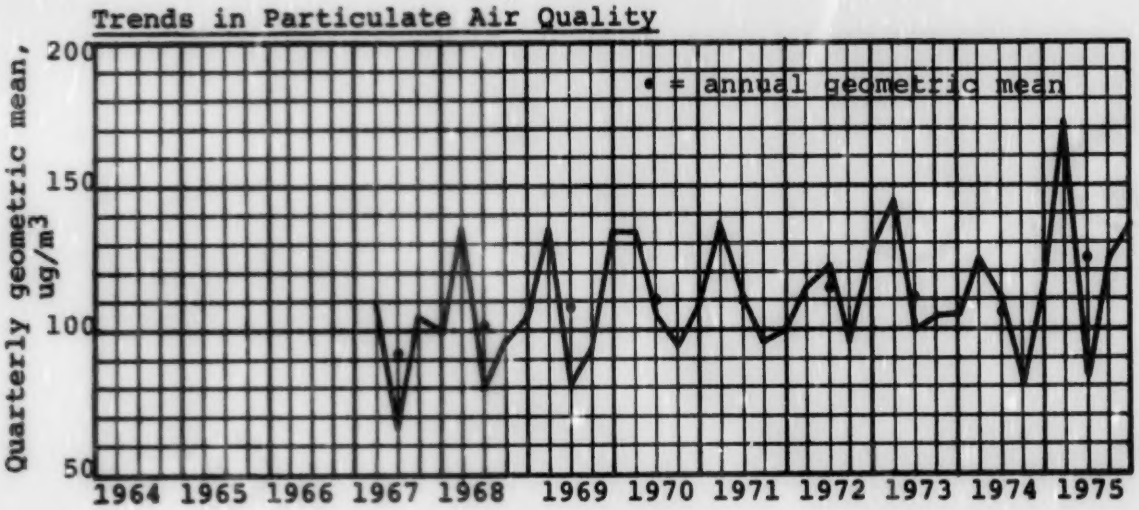
Localized pollution influences - Immediately adjacent to the sampler building is a 35 car parking lot and an unpaved lot 100 feet south. Grandview Avenue, approximately 75 feet from the sampler, is a 4 lane, heavily traveled street.

Physical interferences - There are no obstructions in the immediate vicinity which may interfere with the sampler's readings.

Terrain - The terrain is flat in the immediate vicinity of the sampler, and tapers off to rolling terrain on the fringes of the 1 mile radius survey area.

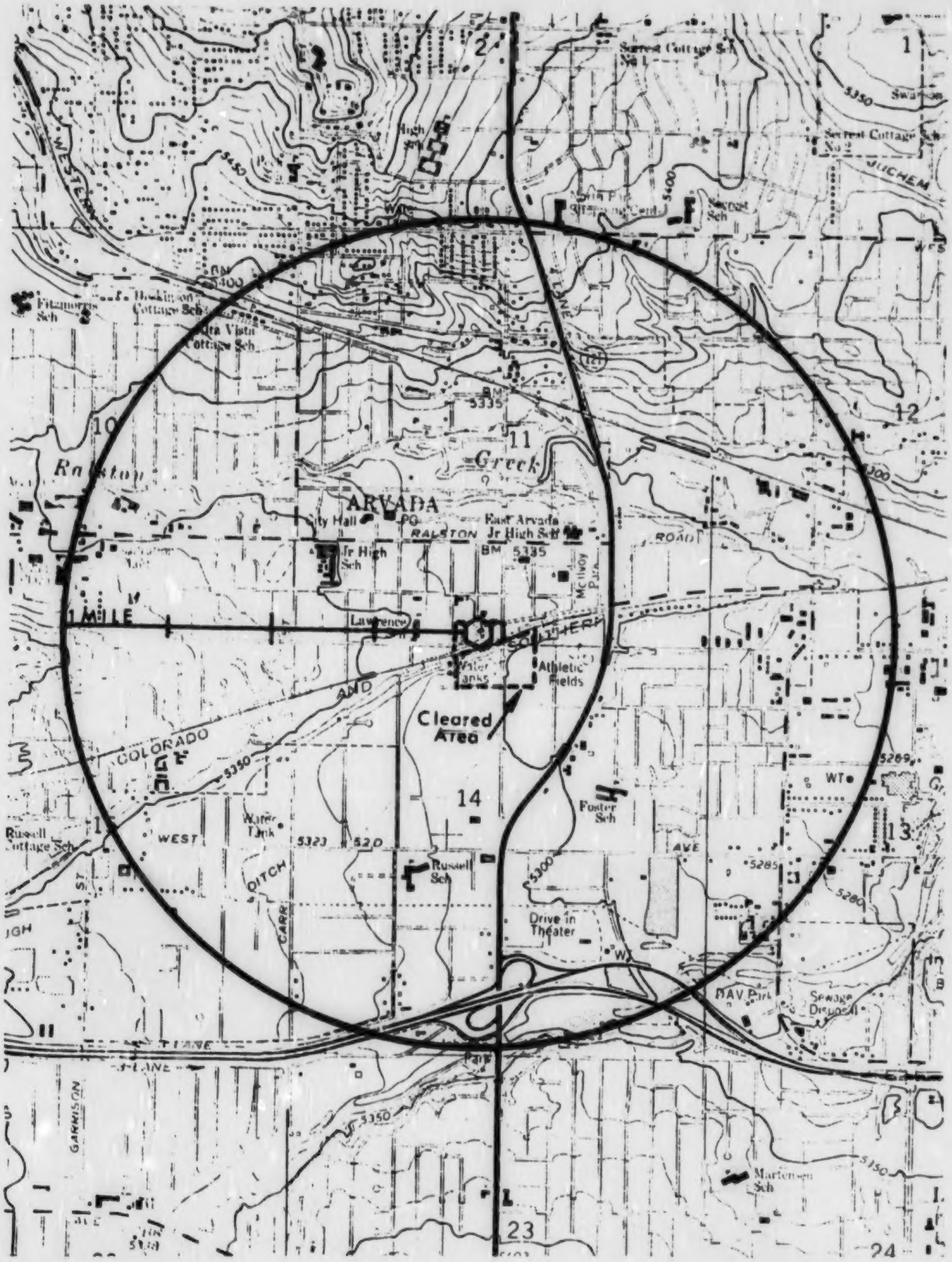
Comments - The entire area is mainly residential with uncleaned streets. It is questionable whether this site allows for representative sampling of the overall air quality in this area due to the localized influences.

Trends in Particulate Air Quality



Arvada sampler viewed to the northeast.

Arvada sampler viewed to the southeast.


1 MILE
ARVADA
City Hall
PO
East Arvada Jr High Sch
Jr High Sch
RALSTON
ROAD
Ralston
Creek
Lawrence
SOUTHERN
COLORADO
AND
Water Tanks
Athletic Fields
Cleared Area
Foster Sch
Russell Sch
Russell Cottage Sch
Water Tank
WEST
DITCH
Drive in Theater
DAV Park
Sewage Disposal
Martensen Sch
Fitzmorris Sch
Hoskinson Cottage Sch
Alta Vista Cottage Sch
Secrest Cottage Sch No 1
Secrest Cottage Sch No 2
Secrest Sch
JUCHEM
WESTERN
GARRISON
AVE
BM 5335
1
2
10
11
12
13
14
23
24
5350
5300
5289
5285
5280

Arvada-Grandview Avenue.

Sources in Microinventory Area (1 mile radius)

Arvada

Population = 6,700
VMT = 214,000

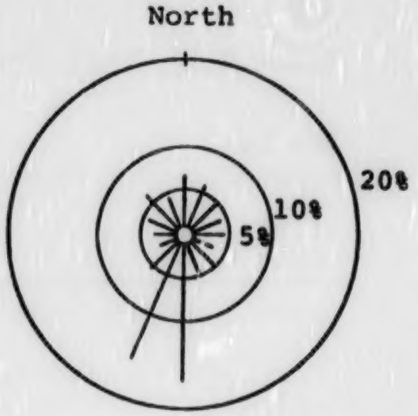
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Asphalt Specialties			20
Strong Brothers			neg
Armcor, Incorporated			1
Ready Mixed Concrete			neg
Spano's Greenhouse			neg
Area sources:			
Fuel combustion	From AQMA emission inventory report, 2.9% of county pop		37
Other mobile			3
Motor vehicle exhaust	214000 VMT/day	0.59 g/VMT	51
Fugitive dust sources:			
Unpaved roads	2.0 mi, 30 ADT	4.5 lb/VMT	49
Unpaved shoulders	2.6 mi	0.62 t/ac/yr	4
Paved roads	214000 VMT/day	3.5 g/VMT	301
Road sanding	From APCD analysis		104
Unpaved parking lots	31 ac	1.4 lb/VMT	18
Cleared areas	22 ac	0.59 t/ac/yr	13
RR right-of-way	23 ac	0.7 t/ac/yr	16
Playgrounds	15 ac	0.62 t/ac/yr	9
Total emissions, ton/yr			626
Emission density, ton/sq mi/yr			199
Percent fugitive dust			82

Meteorological Data

Average annual
wind speed = 10.0 mph

Annual precipitation -
1974 = 14.03"
1975 = 15.51"
Normal = 15.51"

No. of days
with precipitation = 84



Stapleton Airport - 1% calm

Maximum Recorded Concentrations

1974 = 348 ug/m^3; 1975 = 400 ug/m^3

Summary and Conclusions

The Arvada site has recorded annual geometric means over 100 ug/m^3 every year since 1968. In all of these years except one, the highest quarterly average has been in the first (winter) quarter, indicating a strong seasonal impact from a source such as road sanding. The microinventory showed that the three source categories with greatest emissions, accounting for 73 percent of particulate emissions in the survey area, were all traffic related--dust from paved roads, street sanding, and motor vehicle exhaust.

The estimated emission density for the area surrounding the site did not appear sufficient to cause the high ambient readings at the site. Evaluation of the site location revealed a probable bias due to its close proximity to a major arterial street.

If a site in the same area but without the localized influence still exceeded the annual standard, the only sources that would be further controllable would be reentrained dust from the streets (including sand for snow control) and some minor fugitive dust sources. The feasibility of reducing emissions from streets has not yet been determined, but this source category constitutes such a pervasive problem in the Denver area that it should certainly be investigated in detail. The requirement of an SIP revision would provide an impetus and set a schedule for such an investigation.

3.3 AURORA-AURORA CIVIC CENTER
SAROAD Site No. 06-0140-001

Description

General site description - The sampler is located on the roof of the Aurora Civic Center Building (1633 Florence Street) about 15 feet above ground level. It is set back about 50 feet to the west of Florence Street. The surrounding area is combined light commercial and residential land use.

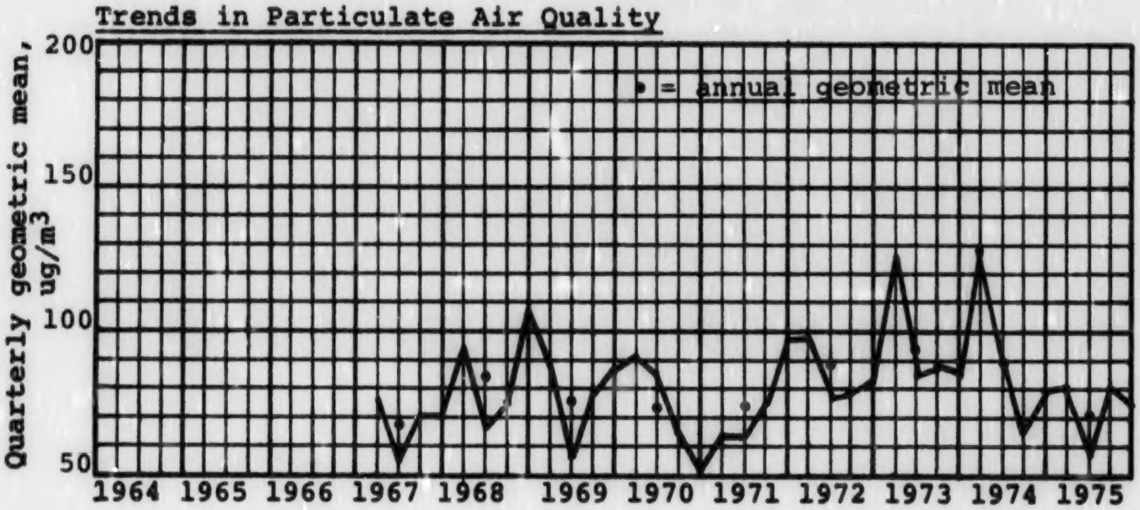
Localized pollution influences - There is a large (5 acre) unpaved playground across the street at the Crawford School, about 300 feet from the site. To the rear of the Civic Center, there is a gravel-covered paved alley about 100 feet from the sampler. The roof has a couple of small vents and an air conditioning compressor.

Physical interferences - No obstructions were noted in the immediate vicinity of the sampler. There were no taller buildings in the immediate area.

Terrain - The surrounding area is predominately flat with some rolling areas in the southeast to southwest quadrant. The airport is at lower elevation than most of the site area. The mean elevation is approximately 5,350 feet msl.

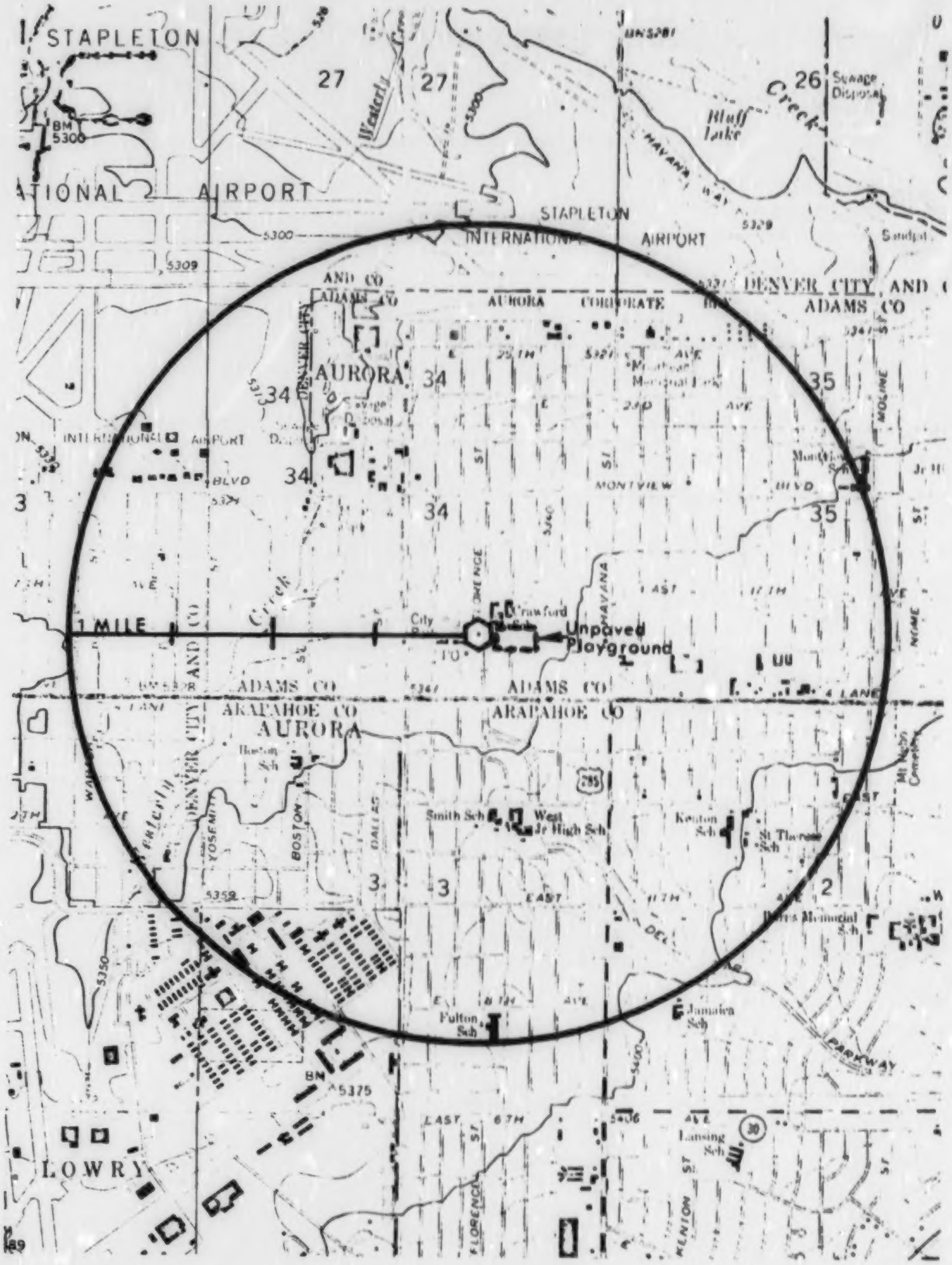
Comments - The site appears to provide a realistic indication of urban exposure. However, Stapleton International Airport is approximately 1 mile due north and there is quite a bit of traffic in the area. Overall, the streets appear somewhat dusty and swept infrequently.

Trends in Particulate Air Quality



Aurora sampler viewed to the west.

Aurora sampler viewed to the east.


STAPLETON
INTERNATIONAL AIRPORT
STAPLETON INTERNATIONAL AIRPORT
27
26
Sewage Disposal
Bluff Lake
Creek
Westerly Creek
AURORA CORPORATE
DENVER CITY AND CO
ADAMS CO
AURORA
34
35
Savage Disposal
MONTVIEW BLVD
1 MILE
Crawford
City
Unpaved Playground
ADAMS CO
ARAPAHOE CO
AURORA
Boston Sch
Smith Sch
West Jr High Sch
Kenton Sch
St Therese Sch
Fulton Sch
Jamaica Sch
PARKWAY
LOWRY
Lansing Sch
HAVANA
DALLAS
BOSTON
YOSEMITE
FLORENCE
KLNION
MOLINE
3
2
BM 5300
BM 5375

Aurora-Aurora Civic Center.

Sources in Microinventory Area (1 mile radius)

Population = 7,200
Aurora VMT = 190,000

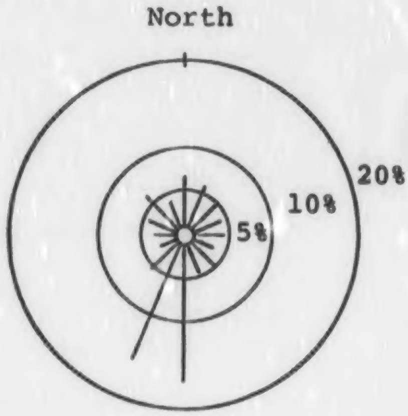
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Area sources:			
Fuel combustion	From AQMA emission inventory report, 2.0% of Adams and Arapahoe pop		26
Other mobile			3
Motor vehicle exhaust	190000 VMT/day	0.59 g/VMT	45
Fugitive dust sources:			
Unpaved roads	4.3 mi, 10 ADT	3.5 lb/VMT	27
Unpaved shoulders	1.0 mi	0.62 t/ac/yr	1
Paved roads	190000 VMT/day	3.5 g/VMT	268
Road sanding	From APCD analysis		174
Unpaved parking lots	22 ac	1.4 lb/VMT	13
Cleared areas	7 ac	0.59 t/ac/yr	4
Playgrounds	3 ac	0.62 t/ac/yr	2
Total emissions, ton/yr			563
Emission density, ton/sq mi/yr			179
Percent fugitive dust			87

Meteorological Data

Average annual
wind speed = 10.0 mph

Annual precipitation -
1974 = 14.03"
1975 = 15.51"
Normal = 15.51"

No. of days
with precipitation = 84



Stapleton Airport - 1% calm

Maximum Recorded Concentrations

1974 = 329 ug/m^3; 1975 = 231 ug/m^3

Summary and Conclusions

After a three year excursion above the standards, the Aurora site in 1975 was below both the annual and 24-hour primary standards. The microinventory showed that almost all the emissions in this commercial and residential area were traffic or fuel combustion related. No point sources were identified within a one mile radius of the sampler.

The site seems to be representative for the Aurora area; no local interferences were noted.

The current emission density of 179 ton/sq mi/yr would substantiate ambient concentrations below the standards. Therefore, it was concluded that Aurora should no longer be classified as a non-attainment site.

3.4 BRIGHTON-BRIGHTON NATIONAL BANK
SAROAD Site No. 06-0240-001

Description

General site description - The sampler is located on the roof of the Brighton National Bank (15 South Main) set back from Main Street approximately 30 feet. It is in the commercial district of town and the area on the periphery is comprised of residential and open areas.

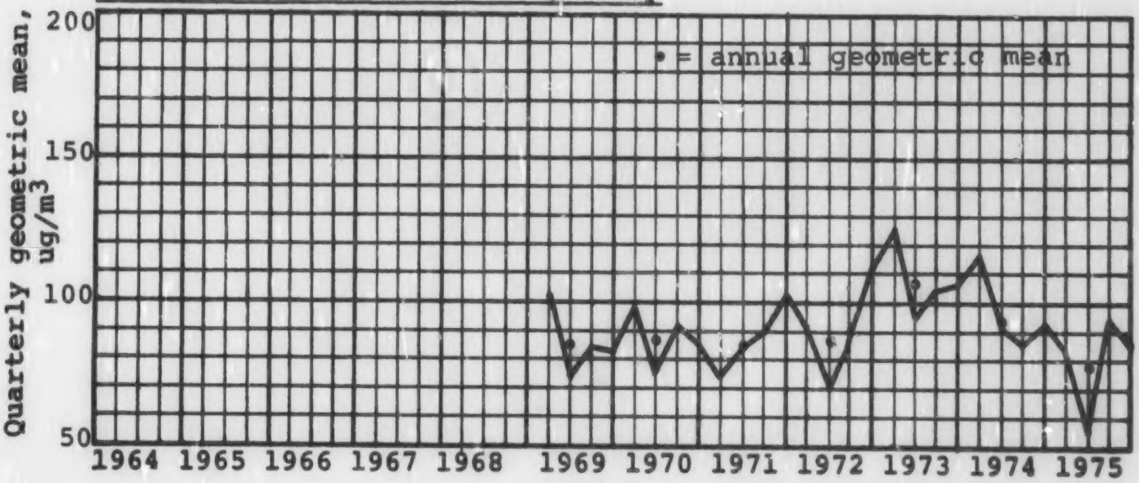
Localized pollution influences - The roof of the bank is composed of loose gravel; it has an incinerator vent 50 feet east and a furnace vent 30 feet east of and 12 feet higher than the sampler. It is 900 feet from Highway 85 (4 lanes, extending north-south).

Physical interferences - The sampler is located 18 feet west of a 10 foot elevator tower wall, which may partially screen air movements from the east or town side. It is higher than all surrounding structures.

Terrain - The immediate site area and surrounding survey area is generally flat with some rolling hills to the west. The mean elevation is approximately 4,950 feet msl.

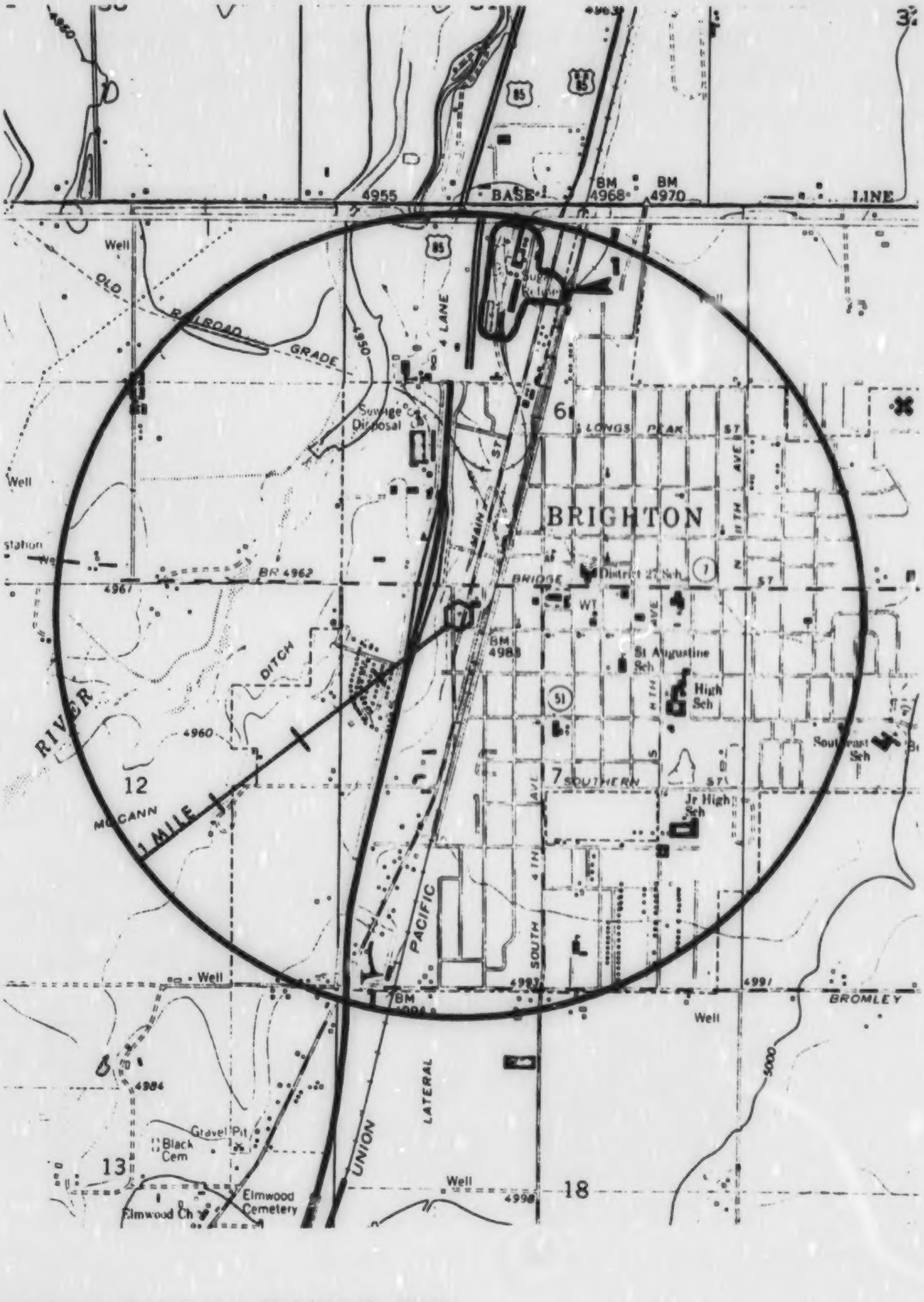
Comments - The older sections of town are very dusty due to many unpaved roads, lots, and driveways. Overall, streets are dusty and poorly swept. Much agriculture surrounds the site area and the land is very dry and arid.

Trends in Particulate Air Quality



Brighton sampler viewed to the north.

Brighton sampler viewed to the south.


BASE
LINE
BM 4968
BM 4970
4955
Well
OLD RAILROAD GRADE
4 LANE
Sewage Disposal
6
LONGS PEAK ST
BRIGHTON
Well
Station
BR 4962
4967
BRIDGE ST
District 27 Sch
WT
BM 4983
St Augustine Sch
High Sch
DITCH
RIVER
4960
12
McCANN
1 MILE
7
SOUTHERN ST
Jr High Sch
Southeast Sch
PACIFIC
SOUTH 4TH AVE
MAIN ST
Well
BM
4997
BROMLEY
Well
4986
LATERAL
UNION
Gravel Pit
Black Cem
13
Elmwood Cemetery
Elmwood Ch
Well
4998
18
5000

Brighton-Brighton National Bank.

Sources in Microinventory Area (1 mile radius)

Population = 7,400
Brighton VMT = 57,100

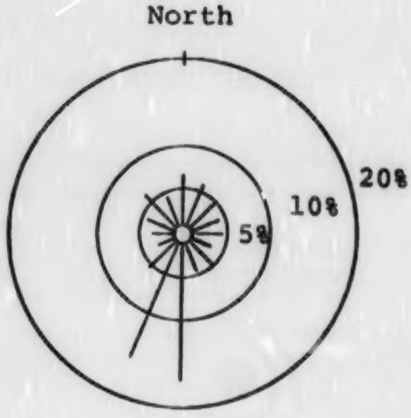
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 Great Western Sugar			72
Brighton Grain			1
Kuner Empson Pickles			neg
Area sources:			
Fuel combustion	From AQMA emission inventory report, 4.0% of county pop		25
Other mobile			4
Motor vehicle exhaust	57100 VMT/day	0.59 g/VMT	14
Fugitive dust sources:			
Unpaved roads	2.7 mi, 20 ADT	3.5 lb/VMT	34
Unpaved shoulders	1.5 mi	0.62 t/ac/yr	2
Paved roads	57100 VMT/day	3.5 g/VMT	80
Unpaved parking lots	10 ac	1.4 lb/VMT	6
Agriculture	185.4 ac	0.22 t/ac/yr, 0.09 t/ac/yr tilling	57
Construction	6.0 ac, 4 mo	0.62 t/ac/mo	15
Cleared areas	64.8 ac	0.59 t/ac/yr	38
RR right-of-way	12 ac	0.7 t/ac/yr	7
RR yards	22 ac	0.7 t/ac/yr	16
Playgrounds	3 ac	0.62 t/ac/yr	2
Total emissions, ton/yr			373
Emission density, ton/sq mi/yr			119
Percent fugitive dust			69

Meteorological Data

Average annual
wind speed = 10.0 mph

Annual precipitation -
1974 = 14.03"
1975 = 15.51"
Normal = 15.51"

No. of days
with precipitation = 84



Stapleton Airport - 1% calm

Maximum Recorded Concentrations

1974 = 241 ug/m^3; 1975 = 221 ug/m^3

Summary and Conclusions

The Brighton site is outside the influence of the high traffic emissions in the Denver urban area and thus experiences less seasonal variation in particulate concentrations than the urban sites. Although the first and fourth quarters also generally have the highest readings at Brighton, these increases are attributed to the higher potential for wind erosion across croplands when the fields are least protected during the winter months.

There were no predominant contributing sources identified in the survey area. Several different fugitive dust sources accounted for 69 percent of the total emissions, and one large point source was located within a mile of the sampler. The estimated emission density of 119 ton/sq mi/yr was low in comparison with the geometric mean concentration of 78 ug/m^3 (93 ug/m^3 in 1974), but the site does not appear to be unduly influenced by localized sources. The screening effect of a nearby wall would tend to lower rather than increase measured concentrations. Although the emission density in the surrounding area does not seem to be sufficient to produce the observed readings, background concentrations in this agricultural area may be much higher than in adjacent urban and suburban exposures. Background, the nonreducible concentration from naturally-occurring sources, at Brighton is estimated to be 40 to 45 ug/m^3.

The fugitive dust emissions could probably be reduced enough to lower ambient concentrations from 78 to 75 ug/m^3. This could be accomplished by a more comprehensive enforcement program for existing regulations (and thus no SIP revision).

3.5 DENVER-SCHOOL ADMINISTRATION BUILDING
SAROAD Site No. 06-0580-001

Description

General site description - The sampler is located on the roof of the school administration building (414 Fourteenth Street) about 40 feet above ground level. It is situated in the commercial downtown district.

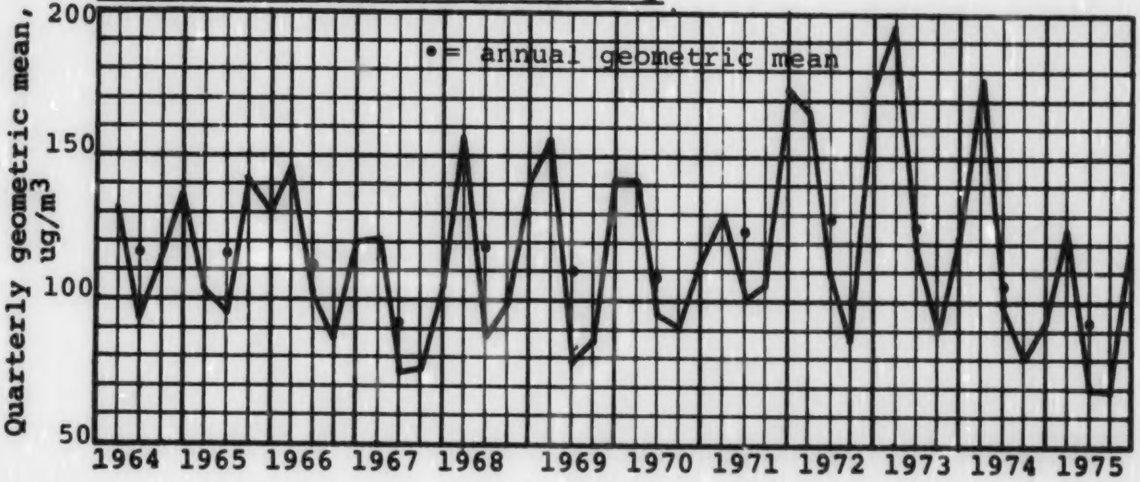
Localized pollution influences - Traffic is the predominant influence in the area. There are several small incinerators on the side of the building, with stacks generally higher than sampler height.

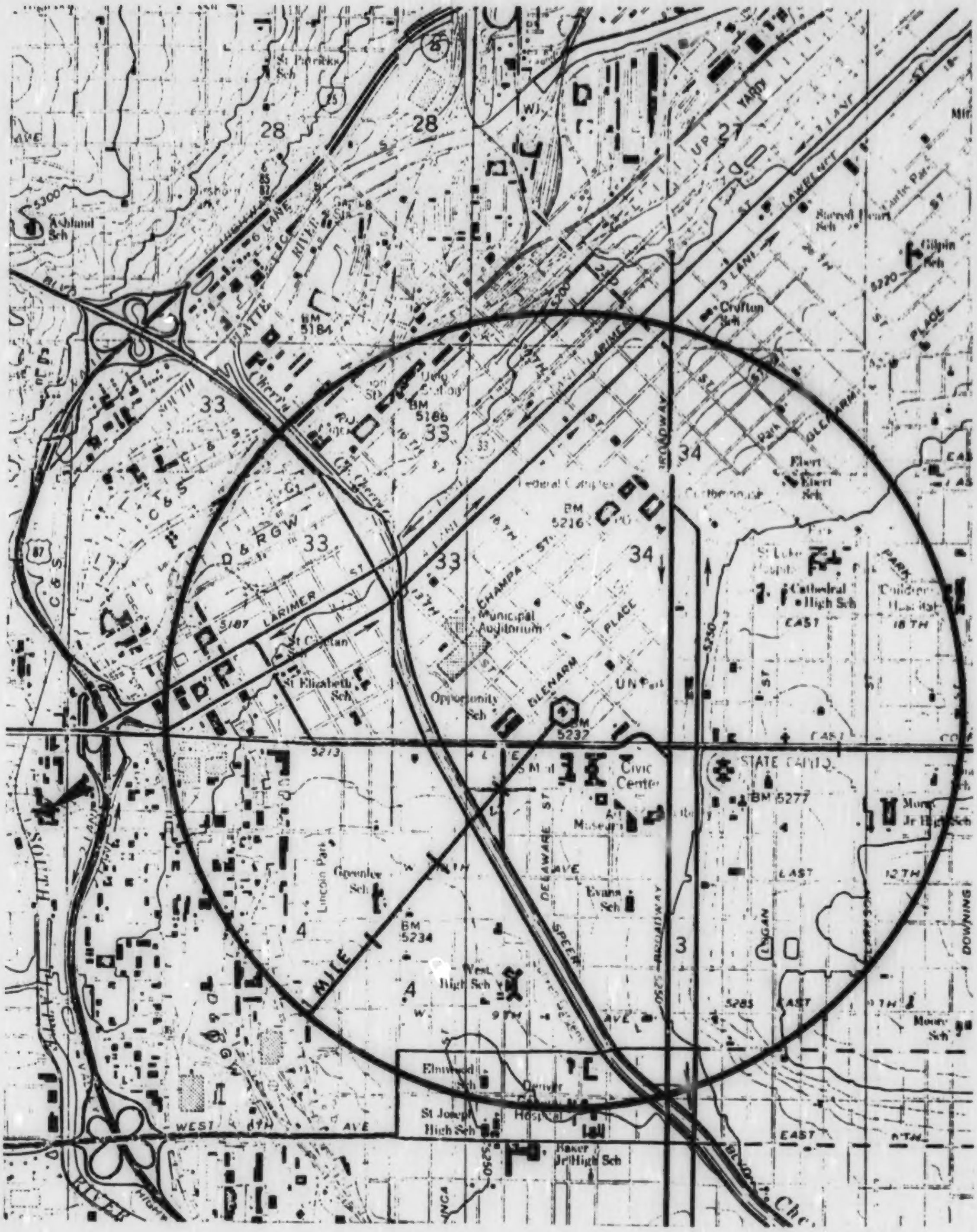
Physical interferences - The only significant obstructions are several roof vents near the sampler.

Terrain - The immediate area and continuing to the periphery of the 1 mile radius circle is generally flat. There are no predominant natural landmarks in the area.

Comments - The sampler siting is satisfactory, and it probably measures quite representatively the downtown air quality.

Trends in Particulate Air Quality




St Patricks Sch
28
28
Ashland Sch
5300
27
UP
YARD
Sacred Heart Sch
Gilpin Sch
Crofton Sch
BM 5184
PLATTE RIVER
33
33
33
33
Union Station
BM 5186
34
34
Federal Complex
BM 5216
Courthouse
Ebert Sch
D & RGW
C & S
87
LARIMER
LAWRENCE
CHAMPA
GLENARM PLACE
BROADWAY
St Luke Hosp
Cathedral High Sch
Childrens Hospital
18TH
St Elizabeth Sch
Municipal Auditorium
Opportunity Sch
BM 5232
5213
Civic Center
STATE CAPITOL
BM 5277
Morey Jr High Sch
Art Museum
Greenlee Sch
Lincoln Park
Evans Sch
DELAWARE ST
SPEER
BM 5234
4
4
3
MILE
West High Sch
9TH
Moore Sch
Elmwood Sch
St Joseph High Sch
Denver Hospital
Baker Jr High Sch
WEST 6TH AVE
EAST
LOGAN
DOWNING
CHERRY CREEK
SOUTH PLATTE RIVER

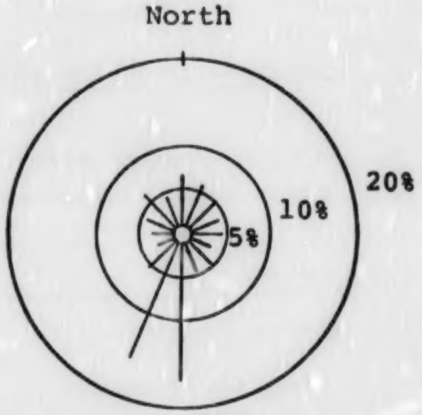
Denver-School Administration Building.

Sources in Microinventory Area (1 mile radius)

Denver-School Administration Building

Population = 19,900
VMT = 730,000

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Mobile Pre-Mix	Outside mile radius		neg
Thompson Pipe & Steel			neg
Thomas Machine			neg
Spratten Materials			neg
Kaiser Refractories			12
Trucker Terminal Elev			neg
Panel Corporation			neg
1 Zuni Power Plant			74
Mobile Pre-Mix			neg
Eversman Manufacturing			neg
Chemitron			neg
Komac			neg
U.S. Mint			1
Public Service Company			59
Area sources:			
Fuel combustion	From AQMA emission inventory report, 3.8% of county pop		137
Other mobile			8
Motor vehicle exhaust	730000 VMT/day	0.59 g/VMT	173
Fugitive dust sources:			
Paved roads	730000 VMT/day	3.5 g/VMT	1027
Road sanding	From APCD analysis		660
Unpaved parking lots	1 ac	1.4 lb/VMT	1
Construction	8 ac, 4 mo	0.62 t/ac/mo	20
Cleared areas	20 ac	0.59 t/ac/yr	12
RR right-of-way	34 ac	0.7 t/ac/yr	24
RR yards	70 ac	0.7 t/ac/yr	49
Total emissions, ton/yr			2183
Emission density, ton/sq mi/yr			695
Percent fugitive dust			82



Stapleton Airport - 1% calm

Meteorological Data

Average annual
wind speed = 10.0 mph

Annual precipitation -
1974 = 14.03"
1975 = 15.51"
Normal = 15.51"

No. of days
with precipitation = 84

Maximum Recorded Concentrations

1974 = 436 ug/m^3; 1975 = 333 ug/m^3

Summary and Conclusions

This downtown site in Denver has shown a definite trend toward lower concentrations the past few years, recording an annual mean below 100 ug/m^3 in 1975 for only the second time in its 12 year history. The air quality data exhibit the typical seasonal trend for the Denver area, with high averages in the first and fourth quarters and low averages in the second and third quarters.

Approximately 77 percent of the emissions in the survey area were from reentrained dust from streets and road sanding. Another eight percent were from motor vehicle exhaust. Therefore, significant emission reductions (sufficient to attain the primary standard) appear to be achievable only by improved street cleaning measures or traffic controls. An SIP revision would probably be required for either of these approaches.

The estimated emission density agrees well with the high measured concentrations, and no site location biases that would inflate the measured readings were noted.

3.6 DENVER-CAMP
SAROAD Site No. 06-0580-002

Description

General description - The sampler is located on the roof of the CAMP station (2105 Broadway) about 9 feet above ground level. It is in the center of the downtown commercial district. Located on a street island, it is surrounded by arterial streets 10-20 feet distant.

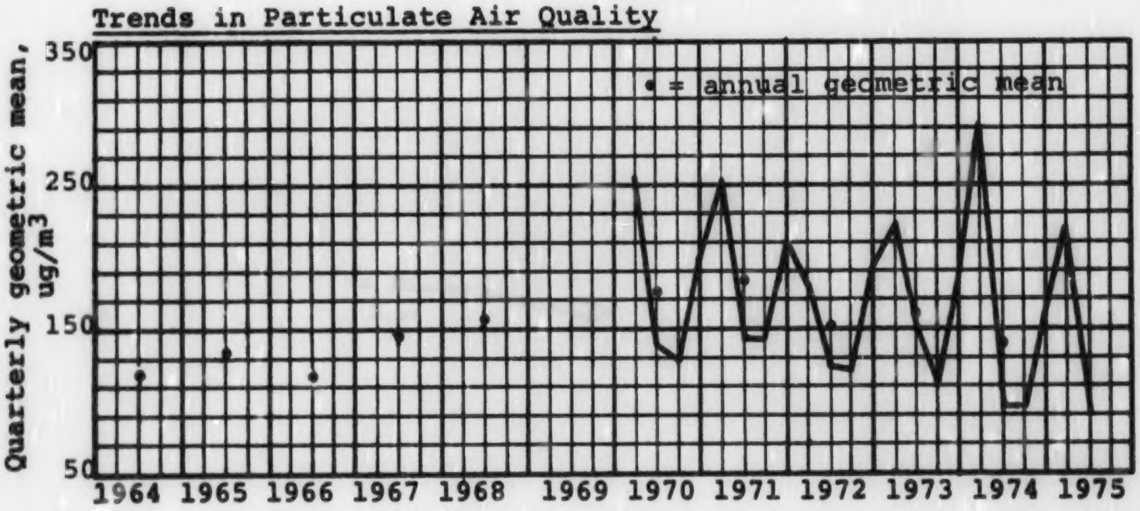
Localized pollution influences - Traffic-generated particulates are the predominant source at this site.

Physical interferences - The sampler sits in a shallow "street canyon" surrounded by buildings. These, however, are low (1-2 stories) and do not form a continuous wall. Buildings are located within 100 feet in most directions.

Terrain - The immediate area and entire 1 mile radius survey area is flat with no predominant natural features. The downtown buildings create a rough surface and cause much channeling and local turbulence.

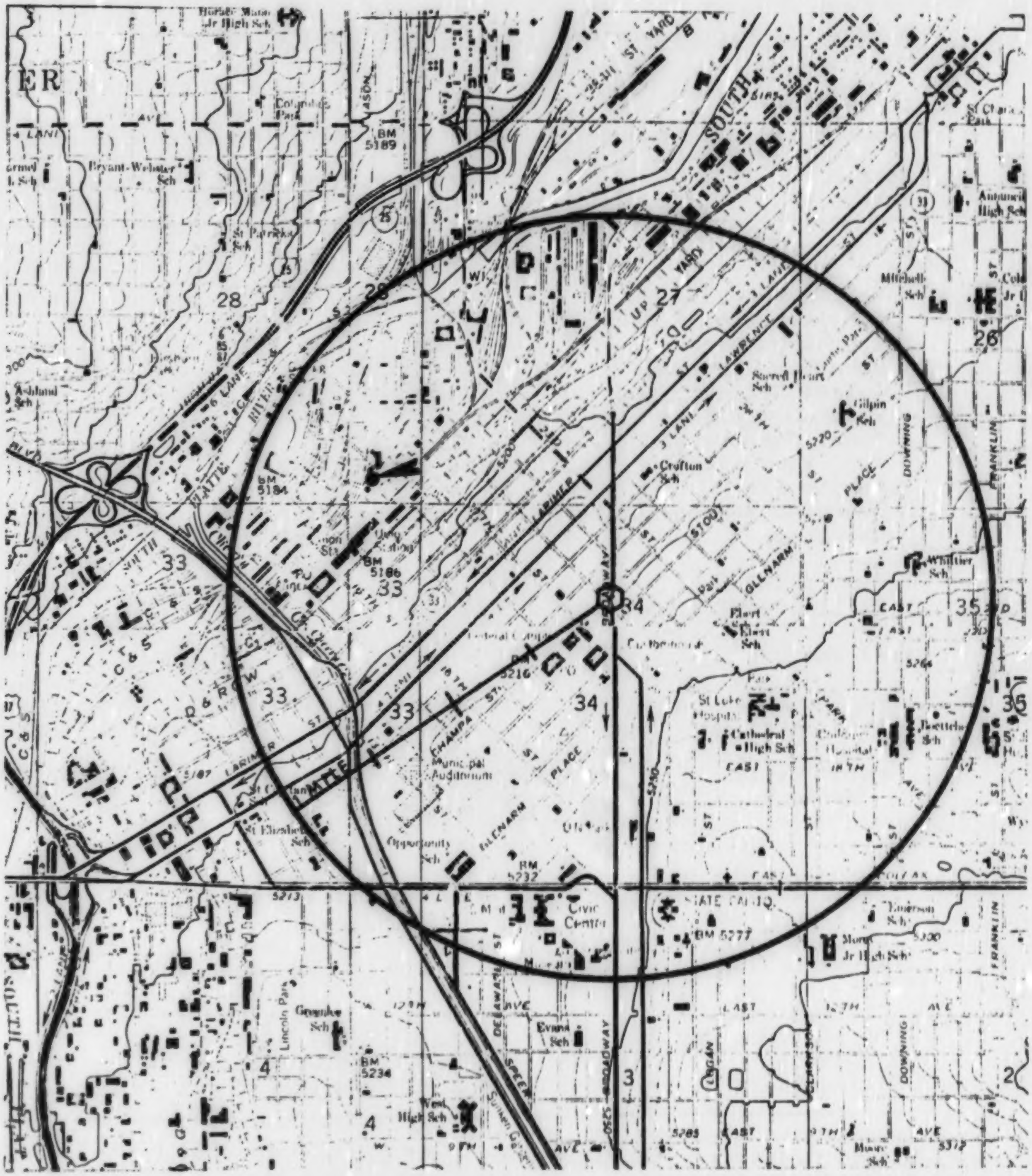
Comments - The sampler is probably measuring the downtown air quality at street level quite representatively. As stated above, the readings are mainly influenced by traffic in this area.

Trends in Particulate Air Quality



Denver-CAMP sampler viewed to the south.

Denver-CAMP sampler viewed to the northwest.



Columbus Park
Bryant-Webster Sch
St Patricks
Ashland Sch
Platte River
Union Station
Federal Camp
Sacred Heart Sch
Gilpin Sch
Crofton Sch
Whittier Sch
Ebert Sch
Cathedral High Sch
St Lukes Hospital
Boettcher Sch
Municipal Auditorium
Opportunity Sch
St Elizabeths Sch
Civic Center
State Capitol
Emerson Sch
Morey Jr High Sch
Lincoln Park
Greenlee Sch
Evans Sch
West High Sch
Mitchell Sch
Annunciation High Sch
Lawrence
Larimer
Champa
Glenarm
Stout
Downing
Franklin
Broadway
Speer
Logan
Colfax
East 17th Ave
East 13th Ave
East 9th Ave
BM 5189
BM 5184
BM 5186
BM 5216
BM 5232
BM 5234
BM 5277
5220
5213
5300
5312
UP Yard
South
D & R G W
C & S
26
27
28
33
34
35
2
3
4

Denver-CAMP.

Sources in Microinventory Area (1 mile radius)

Denver-CAMP

Population = 16,800
VMT = 496,000

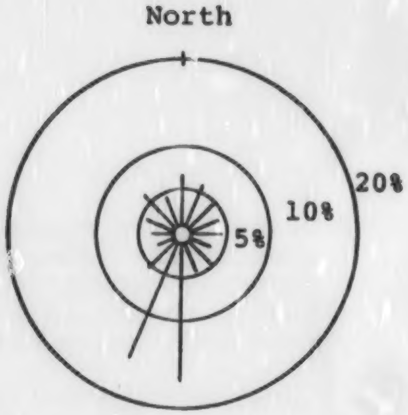
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Mobile Pre-Mix			neg
Thompson Pipe & Steel			neg
Thomas Machine			neg
Spratten Materials			neg
Kaiser Refractories			12
Trucker Terminal Elev			neg
Panel Corporation			neg
Zuni Power Plant	Outside mile radius		74
Mobile Pre-Mix			neg
Eversman Manufacturing			neg
Chemitron			neg
Komac			neg
U.S. Mint			1
1 Public Service Company			59
Area sources:			
Fuel combustion	From AQMA emission inventory report, 3.2% of county pop		115
Other mobile			10
Motor vehicle exhaust	496000 VMT/day	0.59 g/VMT	118
Fugitive dust sources:			
Paved roads	496000 VMT/day	3.5 g/VMT	699
Road sanding	From APCD analysis		591
Unpaved parking lots	14 ac	1.4 lb/VMT	8
Construction	11 ac, 4 mo	0.62 t/ac/mo	27
Cleared areas	20 ac	0.59 t/ac/yr	12
RR right-of-way	61 ac	0.7 t/ac/yr	43
RR yards	172 ac	0.7 t/ac/yr	121
Playgrounds	4 ac	0.62 t/ac/yr	2
Total emissions, ton/yr			1818
Emission density, ton/sq mi/yr			579
Percent fugitive dust			83

Meteorological Data

Average annual
wind speed = 10.0 mph

Annual precipitation -
1974 = 14.03"
1975 = 15.51"
Normal = 15.51"

No. of days
with precipitation = 84



Stapleton Airport - 1% calm

Summary and Conclusions

The CAMP site in Denver has an extended record of annual geometric means near 100 ug/m^3 and the same strong seasonal variations as the other urban Denver sites. The emissions in the survey area were determined to be 71 percent from paved roads and road sanding, with six percent from motor vehicle exhaust. As with most of the Denver area sites, most of the emissions and potential emission reductions appear to be traffic related. Due to the widespread nature of this source impact and the extent of standards' violations, the need for an SIP revision is well established.

Even though this site is near ground level and close to three major streets, it is probably representative of human exposure in the central business district. The emission density of 579 ton/sq mi/yr in the survey area indicates that the readings are not unduly influenced by the sampler's location and low height above ground.

3.7 DENVER-GATES RUBBER COMPANY
SAROAD Site No. 06-0580-003

Description

General site description - The sampler is located on the roof of the Gates Rubber Plant office building (1050 South Broadway) about 20 feet above ground level. The area is highly industrialized in the western portion of the survey area and residential in the east.

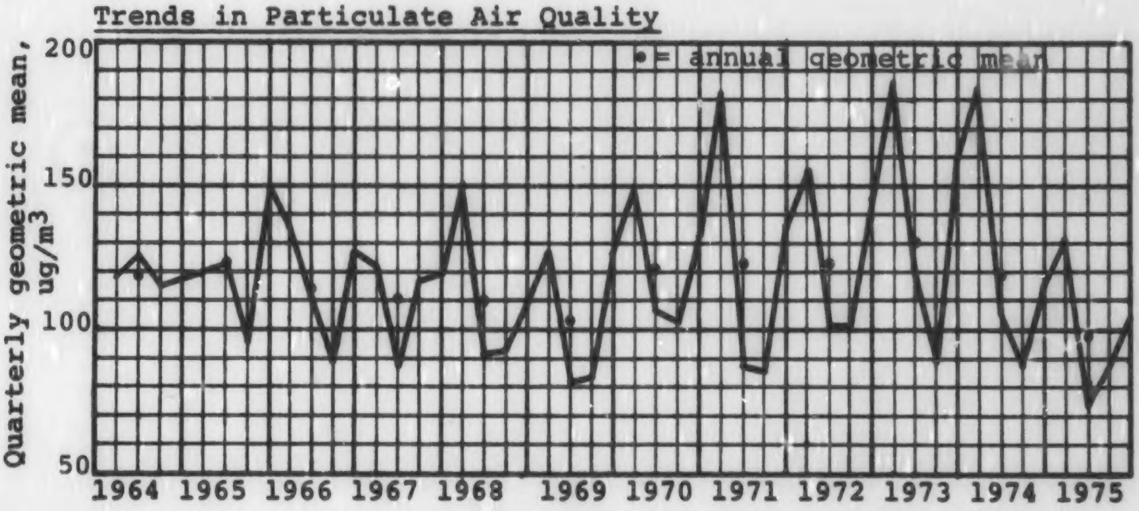
Localized pollution influences - The major influence in the general area would appear to be the Gates Rubber Company. In the immediate sampler vicinity, there are no interfering sources of pollution.

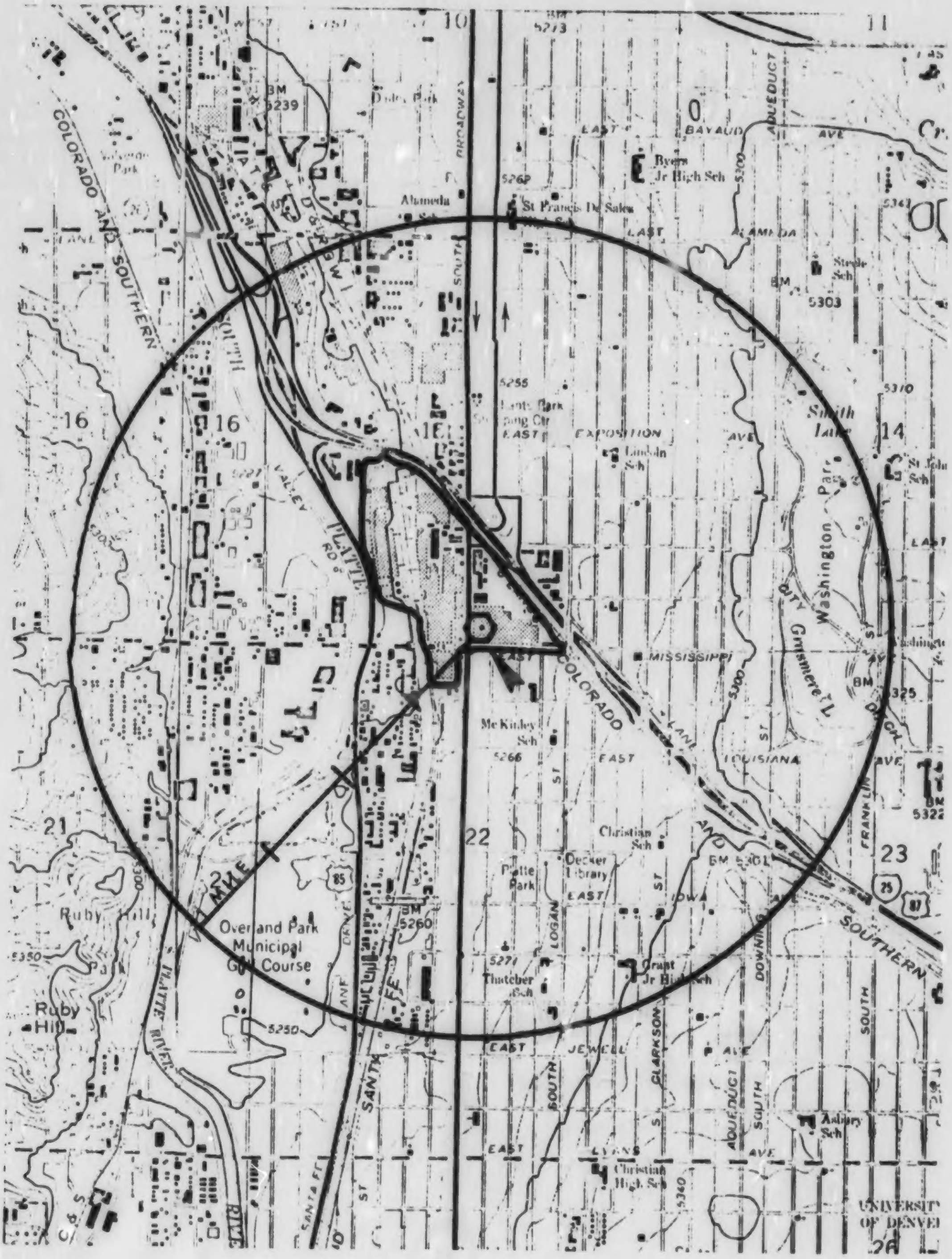
Physical interferences - Roof projections in the vicinity of the sampler would be the only elements that could affect the sampler's readings.

Terrain - The entire area is flat with many large buildings in the western sector. Interstate 25 runs northwest to southeast through the center of the area.

Comments - The sampler is probably drawing representative samples of the air in this industrial region.

Trends in Particulate Air Quality




1 MILE
COLORADO AND SOUTHERN
SOUTH BROADWAY
EAST BAYAUD AVE
AQUEDUCT
Byers Jr High Sch
St Francis De Sales
Alameda Sch
EAST ALAMEDA
Steele Sch
Smith Lake
Washington Park
EXPOSITION
Lincoln Sch
MISSISSIPPI
COLORADO LANE AND SOUTHERN
LOUISIANA
McKinley Sch
Christian Sch
Decker Library
Platte Park
IOWA
Grant Jr High Sch
Thatcher Sch
Overland Park Municipal Golf Course
Ruby Hill
Ruby Hill Park
PLATTE RIVER
SANTA FE
EAST JEWELL
EAST EVANS
Christian High Sch
Asbury Sch
UNIVERSITY OF DENVER
VALLEY RD
PLATTE
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5239
5273
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5303
5255
5266
5260
5271
5250
5301
5350
5310
5325
5322

Denver-Gates Rubber Company.

Sources in Microinventory Area (1 mile radius)

Population = 21,600
Denver-Gates Rubber Company VMT = 493,000

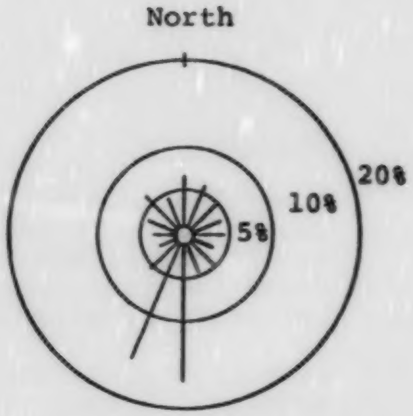
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 Gates Rubber Company			31
Copeland Concrete			neg
Ace Block			neg
Ready-Mix			neg
Area sources:			
Fuel combustion	From AQMA emission inventory report, 4.2% of county pop		151
Other mobile			13
Motor vehicle exhaust	493000 VMT/day	0.59 g/VMT	117
Fugitive dust sources:			
Unpaved roads	1.5 mi, 30 ADT	3.5 lb/VMT	29
Unpaved shoulders	3 ac	0.62 t/ac/yr	2
Paved roads	493000 VMT/day	3.5 g/VMT	694
Road sanding	From APCD analysis		382
Unpaved parking lots	10 ac	1.4 lb/VMT	6
Construction	12 ac, 4 mo	0.62 t/ac/mo	30
Cleared areas	37 ac	0.59 t/ac/yr	22
RR right-of-way	46 ac	0.7 t/ac/yr	32
RR yards	12 ac	0.7 t/ac/yr	8
Aggregate storage	6 ac	1.9 t/ac/yr	11
Playgrounds	7 ac	0.62 t/ac/yr	4
Total emissions, ton/yr			1532
Emission density, ton/sq mi/yr			488
Percent fugitive dust			80

Meteorological Data

Average annual
wind speed = 10.0 mph

Annual precipitation -
1974 = 14.03"
1975 = 15.51"
Normal = 15.51"

No. of days
with precipitation = 84



Stapleton Airport - 1% calm

Maximum Recorded Concentrations

1974 = 357 ug/m^3; 1975 = 405 ug/m^3

Summary and Conclusions

This sampler had always shown annual mean concentrations in the range of 100 to 130 ug/m^3 until 1975, when the annual mean dropped to 98 ug/m^3. In spite of the site's industrial exposure, it demonstrates the same marked seasonal variations as the more traffic-oriented sites. The microinventory results reveal that this is because 70 percent of the inventoried emissions are from paved roads and road sanding.

The estimated emission density of 488 ton/sq mi/yr supports the high measured concentrations. It is concluded that the same control measures which would be effective at other urban Denver sites would also reduce emissions substantially at this site.

3.8 DENVER-WASTEWATER TREATMENT PLANT
SAROAD Site No. 06-0580-004

Description

General site description - The sampler is located on the roof of a pumphouse at the Wastewater Treatment Plant (51st and Franklin) about 10 feet above ground level. The immediate and surrounding area is completely industrial. It is not near any major highways.

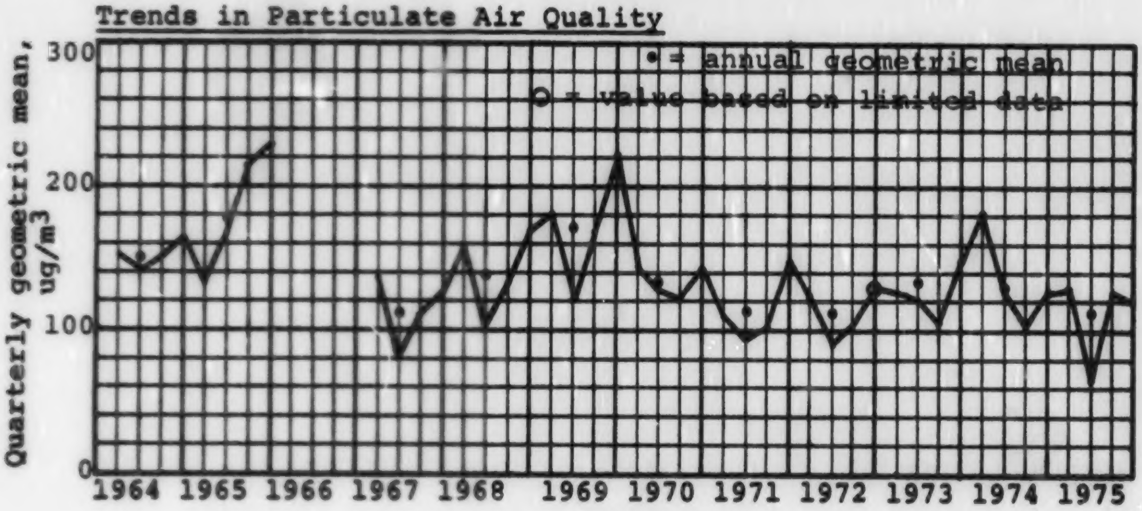
Localized pollution influences - Immediately adjacent to the sampler (25 feet) is the plant access road which is bare and under construction. Major industrial sources exist within 1/8 mile. In the immediate vicinity (300 feet) are many open areas and unpaved parking lots.

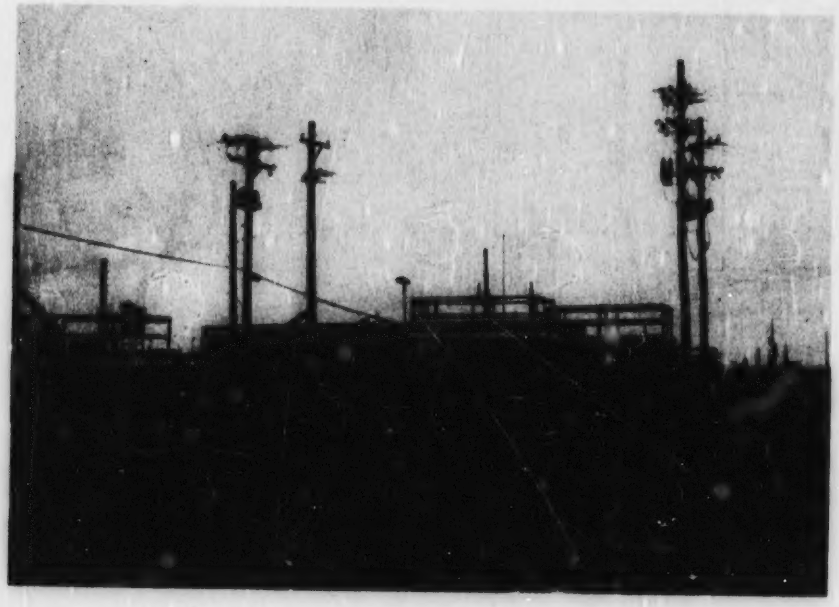
Physical interferences - No physical obstructions exist which could affect the readings of the sampler.

Terrain - The immediate and surrounding peripheral terrain in this survey area is mostly flat to rolling and devoid of predominant natural features.

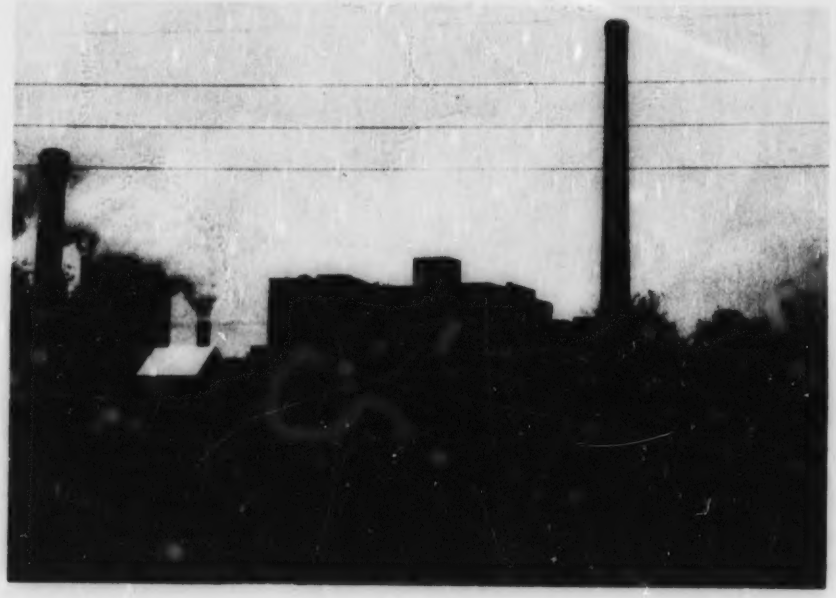
Comments - The sampler is situated well and probably represents the air quality in this industrial area quite accurately.

Trends in Particulate Air Quality

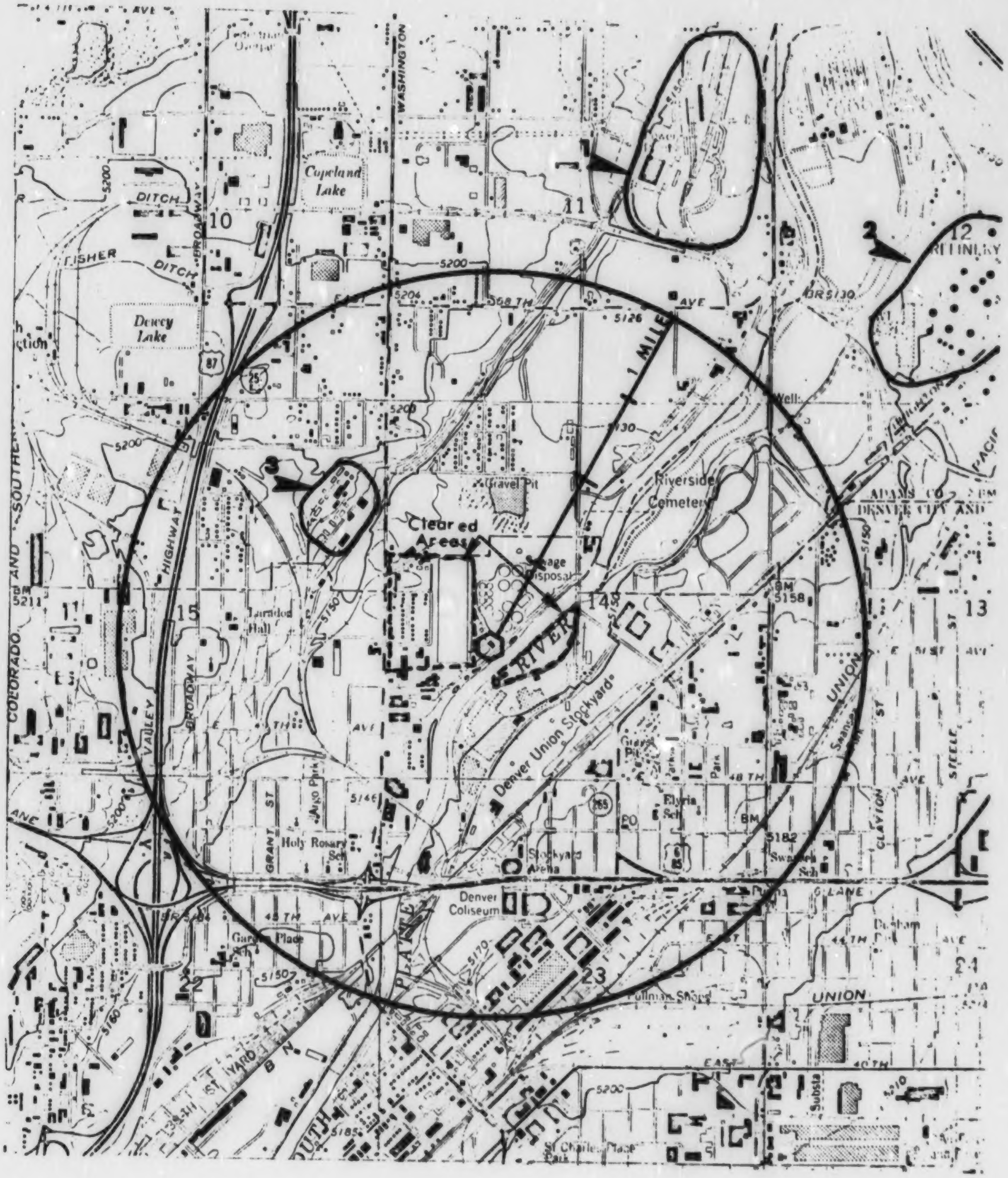




Denver-Wastewater Treatment Plant sampler viewed to the north.



Denver-Wastewater Treatment Plant sampler viewed to the east.


Copeland Lake
Dewey Lake
DITCH
FISHER DITCH
WASHINGTON
BROADWAY
HIGHWAY
VALLEY
COLORADO AND SOUTHERN
1 MILE
Cleared Areas
Gravel Pit
Sewage Disposal
RIVER
Riverside Cemetery
Denver Union Stockyards
Holy Rosary Sch
Stockyard Arena
Denver Coliseum
Elyria Sch
Swansea Sch
Pullman Shops
REFINERY
ADAMS CO
DENVER CITY AND
UNION
PLATTE
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Denver-Wastewater Treatment Plant.

Sources in Microinventory Area (1 mile radius)

Denver-Wastewater Treatment Plant

Population = 2,500 (est)
VMT = 185,000

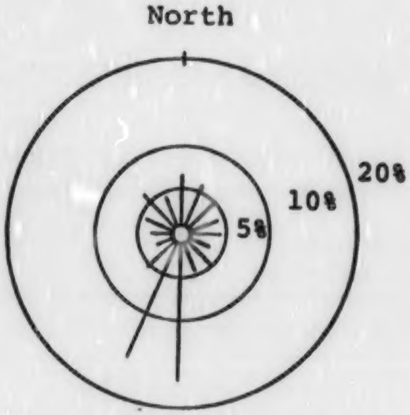
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Denver Recycling			neg
1 Cherokee Power Plant	Outside mile radius		925
Denver Highway Div			neg
Clalite Concrete			neg
Cudahy			6
Birko Chemical			neg
2 Conoco Refinery	Outside mile radius		254
3 ASARCO-Globe Plant			25
Twin Mountain Rock			neg
Midwest Steel & Iron			neg
Associated Grocers			neg
Trumbull Asphalt			6
Area sources:			
Fuel combustion	From AQMA emission inventory report, 0.5% of Denver county pop		18
Other mobile			2
Motor vehicle exhaust	185000 VMT/day	0.59 g/VMT	44
Fugitive dust sources:			
Unpaved roads	5.1 mi, 50 ADT	3.5 lb/VMT	163
Unpaved shoulders	17 ac	0.62 t/ac/yr	10
Paved roads	185000 VMT/day	3.5 g/VMT	261
Road sanding	From APCD analysis		273
Unpaved parking lots	88 ac	1.4 lb/VMT	51
Agriculture	100 ac	0.59 t/ac/yr	59
Cleared areas	156 ac	0.31 t/ac/yr	48
RR right-of-way	26 ac	0.7 t/ac/yr	18
RR yards	42 ac	0.7 t/ac/yr	30
Gravel pits/quarries	15 ac	1.9 t/ac/yr	28
Total emissions, ton/yr			1042
Emission density, ton/sq mi/yr			332
Percent fugitive dust			90

Meteorological Data

Average annual
wind speed = 10.0 mph

Annual precipitation -
1974 = 14.03"
1975 = 15.51"
Normal = 15.51"

No. of days
with precipitation = 84



Stapleton Airport - 1% calm

Maximum Recorded Concentrations

1974 = 565 ug/m^3; 1975 = 289 ug/m^3

Summary and Conclusions

This site has always recorded an annual geometric mean above 100 ug/m^3 throughout its history. It does not display the strong seasonal variations of some of the other Denver area sites, but 51 percent of its estimated emissions are still from paved roads and road sanding. Most of the remaining emissions in the survey area are from many different types of fugitive dust sources, including unpaved roads and parking lots, agriculture, cleared areas, railroad yards, and gravel pits. There are some minor industrial point sources within a one mile radius and some much larger ones outside this mile radius. Because of the large percentage reduction indicated to be necessary in order to attain the primary standard at this site, sources in several different categories would need to be further controlled. For many of the fugitive dust sources, a more comprehensive plan for enforcement of existing regulations could bring about significant emission reductions. None of the point sources are in a noncompliance status.

The site is probably biased somewhat by nearby fugitive dust sources, although similar sources are found throughout the one mile radius survey area. Even with an allowance for the influence of the localized sources, the site would still not reach the level of the standards. The estimated emission density of 332 ton/sq mi/yr is intermediate for the non-attainment sites in the Denver area and would normally be associated with a site reading in the 80's or 90's (annual geometric mean). This site provides additional evidence of the need for an SIP revision for suspended particulate in the Denver AQCR.

3.9 DENVER-C.A.R.I.H.
SAROAD Site No. 06-0580-009

Description

General site description - The sampler is located on the roof of the research center of the C.A.R.I.H. Hospital (2097 Julian) about 20 feet above ground level. The immediate area and greater part of the 1 mile radius survey area is residential. The sampler is set back 100 feet from roads on two sides.

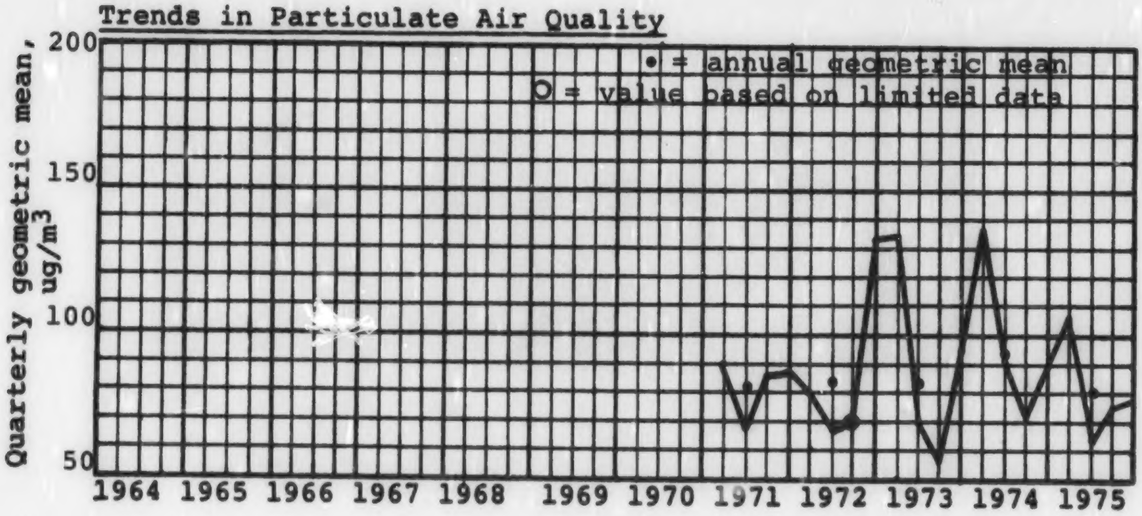
Localized pollution influences - The only adverse influence in the immediate area is about five acres of cleared land 200 feet to the southeast. The streets are swept and clean.

Physical interferences - There are no physical obstructions or tall buildings in the area which would affect the sampler's readings.

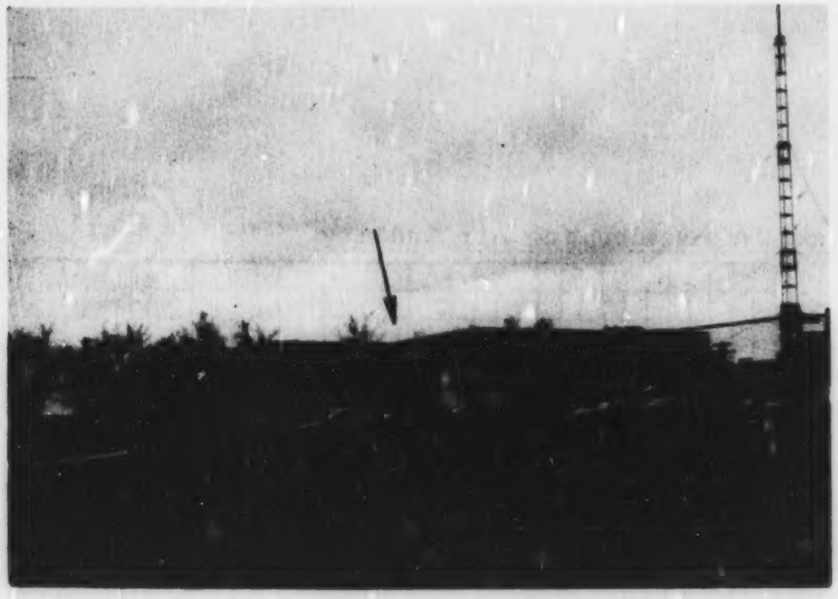
Terrain - The entire area is composed of flat to rolling land. The only predominant natural feature is a shallow gulch at the extreme south of the 1 mile radius.

Comments - The site appears to be located well and depicts the air quality representatively.

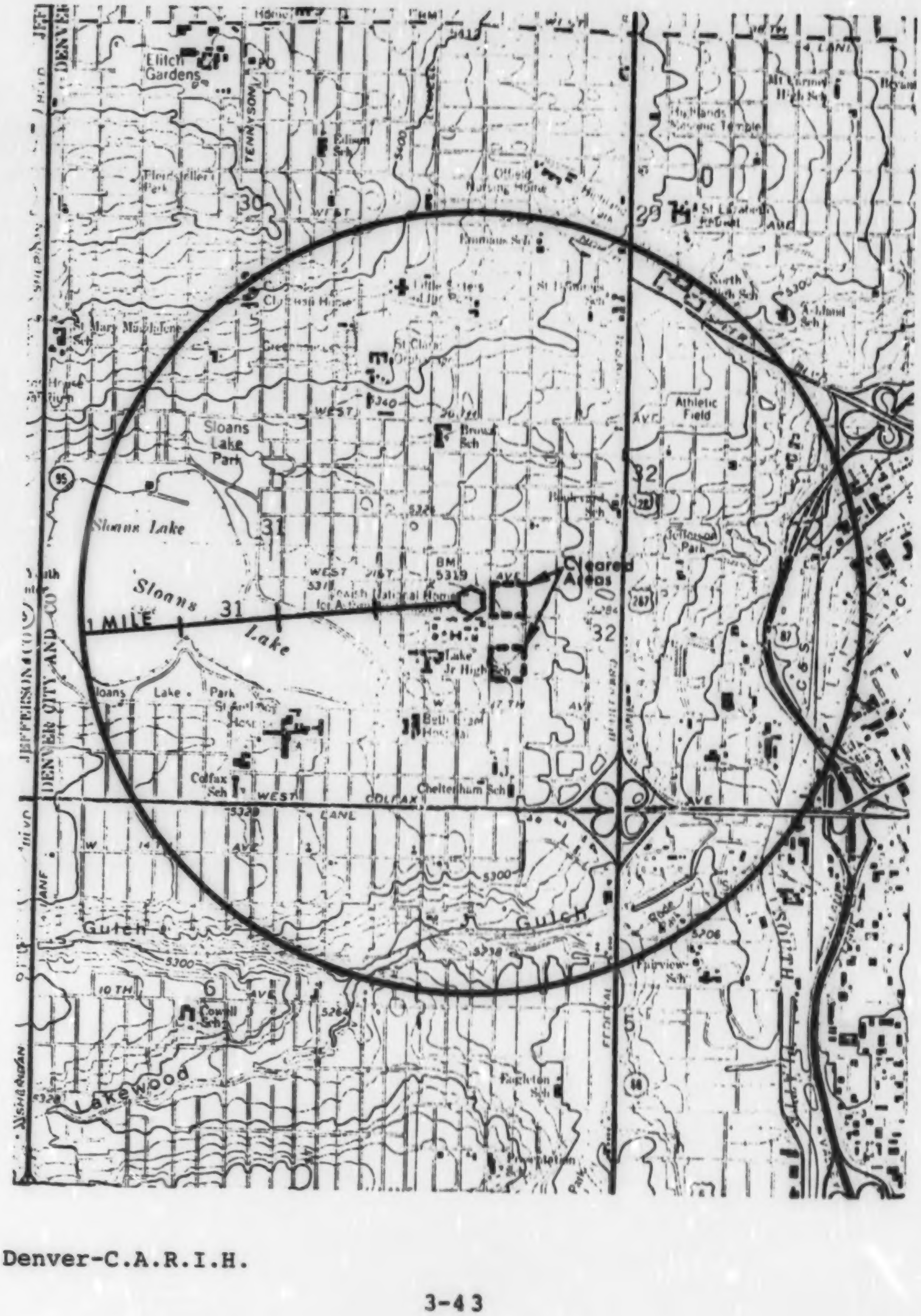
Trends in Particulate Air Quality



Denver-C.A.R.I.H. sampler viewed to the north.



Denver-C.A.R.I.H. sampler viewed to the southeast.


Elitch Gardens
Tennyson
Edison Sch
Sloans Lake Park
Sloans Lake
Sloans Lake
1 MILE
Cleared Areas
BM 5319
Brown Sch
Athletic Field
Jefferson Park
Lake Jr High Sch
Colfax Sch
Cheltenham Sch
West Colfax Ave
Gulch
Gulch
Lakewood
Cowell Sch
Fairview Sch
Eagleton Sch
North High Sch
St Mary Magdalene Sch
Jefferson Co
Denver City and Co
30
31
32
5
6

Denver-C.A.R.I.H.

Sources in Microinventory Area (1 mile radius)

Denver-C.A.R.I.H.
Population = 21,500
VMT = 357,000

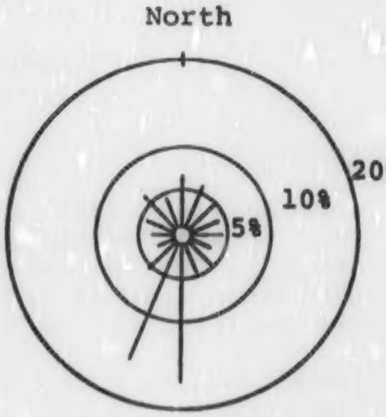
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Nursery Supply			neg
Area sources:			
Fuel combustion	From AQMA emission inventory report, 4.1% of county pop		147
Other mobile			13
Motor vehicle exhaust	357000 VMT/day	0.59 g/VMT	84
Fugitive dust sources:			
Unpaved roads	0.2 mi, 30 ADT	3.5 lb/VMT	4
Unpaved shoulders	0.2 mi	0.62 t/ac/yr	neg
Paved roads	357000 VMT/day	3.5 g/VMT	504
Road sanding	From APCD analysis		417
Unpaved parking lots	10 ac	1.4 lb/VMT	6
Construction	7 ac, 4 mo	0.62 t/ac/mo	17
Cleared areas	22 ac	0.59 t/ac/yr	13
RR right-of-way	7 ac	0.7 t/ac/yr	5
RR yards	17 ac	0.7 t/ac/yr	12
Total emissions, ton/yr			1222
Emission density, ton/sq mi/yr			389
Percent fugitive dust			80

Meteorological Data

Average annual
wind speed = 10.0 mph

Annual precipitation -
1974 = 14.03"
1975 = 15.51"
Normal = 15.51"

No. of days
with precipitation = 84



Stapleton Airport - 1% calm

Maximum Recorded Concentrations

1974 = 317 ug/m^3; 1975 = 252 ug/m^3

Summary and Conclusions

The C.A.R.I.H. site has consistently recorded annual mean concentrations in the 80's since it was installed in 1971. It has a typical pattern of seasonal concentrations for the Denver area. There are no point sources with significant impact on this residential area sampler, and the site appears to be free from any localized influences or physical obstructions.

The major contributing sources identified by the micro-inventory were paved roads, road sanding, and motor vehicle exhaust, together accounting for 82 percent of the emissions. Therefore, attainment at this site is also linked to reduction in these emissions, probably through improved street cleaning or traffic controls.

3.10 ENGLEWOOD-ARAPAHOE COUNTY HEALTH DEPARTMENT
SAROAD Site No. 06-0780-001

Description

General site description - The sampler is located on the roof of the Health Department building (4857 South Broadway) about 15 feet above ground level in a predominately commercial area. It is set back 50 feet from streets parallel to the building on two sides.

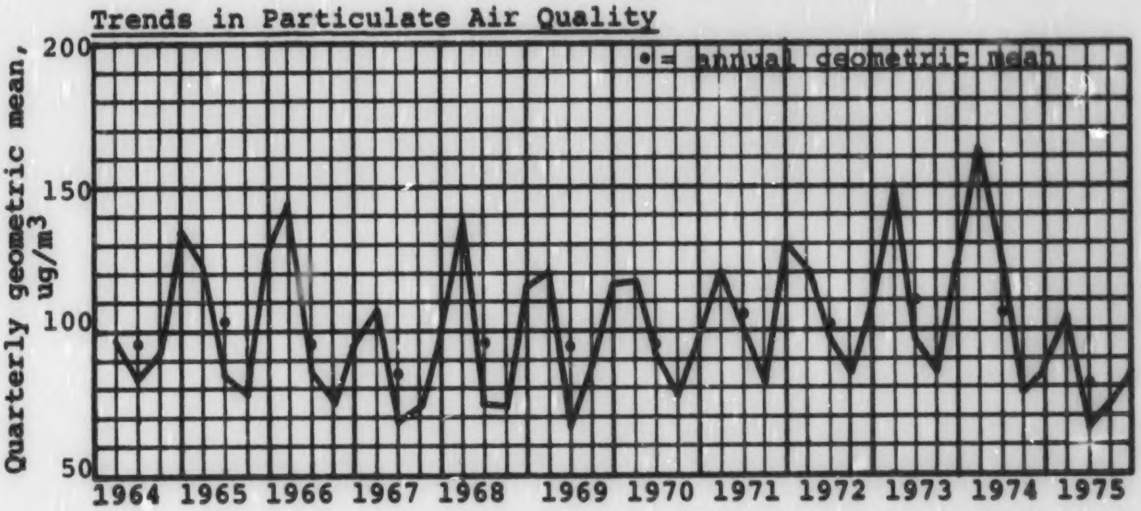
Localized pollution influences - A 4 lane highway borders the building 50 feet east of the sampler, while there is an unpaved storage lot 200 feet to the northwest and a dirty parking lot immediately due west.

Physical interferences - There are no obstructions or tall structures which would affect the sampler's readings in any way.

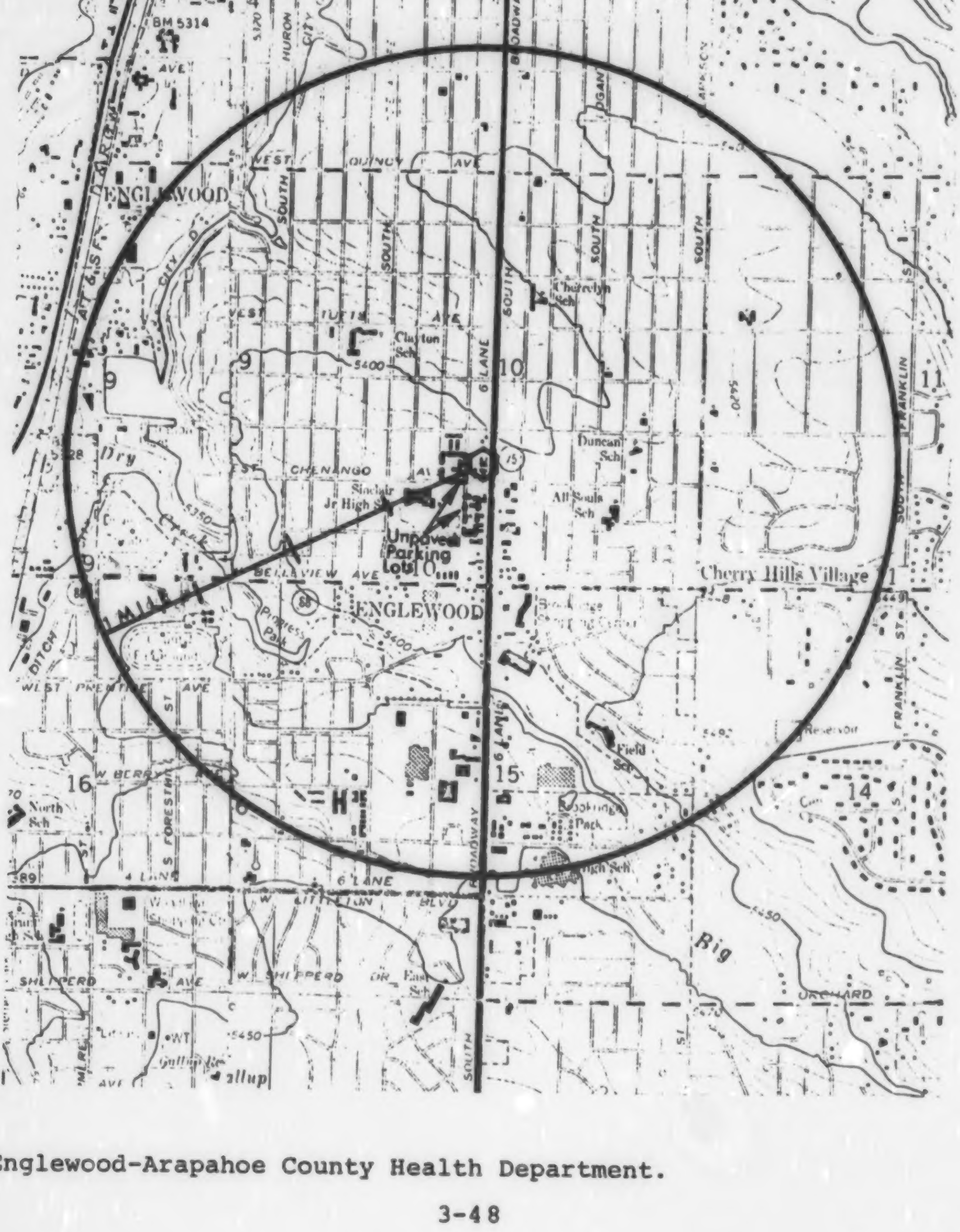
Terrain - The terrain immediately surrounding the sampling site is completely flat. Rolling hills predominate 1/2 mile to the west and south.

Comments - The sampler readings are mainly influenced by traffic in the area. The readings are probably representative of a high density residential area.

Trends in Particulate Air Quality



Englewood sampler viewed to the east.


ENGLEWOOD
Unpaved Parking Lots
Sinclair Jr High Sch
Clayton Sch
Cherrelyn Sch
Duncan Sch
All Souls Sch
Field Sch
Progress Park
Cherry Hills Village
1 MILE
WEST QUINCY AVE
WEST TUFTS AVE
CHENANGO AVE
BELLEVIEW AVE
BROADWAY
W LITTLETON BLVD
Dry Creek
WEST MANSFIELD AVE
Maddox Sch
Lowell Sch
High Sch
North Sch
FRANKLIN ST
SHEPPERD AVE
ORCHARD

Englewood-Arapahoe County Health Department.

Sources in Microinventory Area (1 mile radius)

Englewood

Population = 10,600
VMT = 200,000

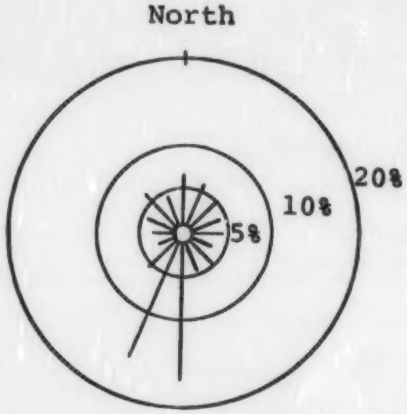
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Area sources:			
Fuel combustion	From AQMA emission inventory report, 6.5% of county pop		43
Incineration			1
Other mobile			5
Motor vehicle exhaust	200000 VMT/day	0.59 g/VMT	48
Fugitive dust sources:			
Unpaved roads	2.7 mi, 10 ADT	3.5 lb/VMT	17
Unpaved shoulders	2.6 mi	0.62 t/ac/yr	4
Paved roads	200000 VMT/day	3.5 g/VMT	282
Road sanding	From APCD analysis		104
Unpaved parking lots	7 ac	1.4 lb/VMT	4
Construction	4 ac, 4 mo	0.62 t/ac/mo	10
Cleared areas	67 ac	0.59 t/ac/yr	39
Playgrounds	7.7 ac	0.62 t/ac/yr	5
Total emissions, ton/yr			562
Emission density, ton/sq mi/yr			179
Percent fugitive dust			83

Meteorological Data

Average annual
wind speed = 10.0 mph

Annual precipitation -
1974 = 14.03"
1975 = 15.51"
Normal = 15.51"

No. of days
with precipitation = 84



Stapleton Airport - 1% calm

Maximum Recorded Concentrations

1974 = 369 ug/m^3; 1975 = 224 ug/m^3

Summary and Conclusions

The Englewood site annual means have centered around the 100 ug/m^3 level over the past 12 years before dropping to 81 ug/m^3 in 1975. The measurements have always shown the characteristic seasonal variations of sites in the urban Denver area. As with most of the other sites, traffic-related emissions were identified as the major contributor in this survey area. No point sources with significant impact on the site were found.

The sampler appears to be well located and not unduly influenced by localized sources. The estimated emission density of 179 ton/sq mi/yr is relatively low for a site exceeding the annual standard. The site survey did not yield a good explanation for the high concentrations measured at this location. Since several other obvious non-attainment sites are located in the Denver AQCR, no further investigation was made of this anomaly.

3.11 LAKEWOOD-CITY-COUNTY HEALTH DEPARTMENT
SAROAD Site No. 06-1260-001

Description

General site description - The sampler is located on the roof of the Health Department (260 South Kipling) about 25 feet above ground level. It is surrounded by residential and open areas.

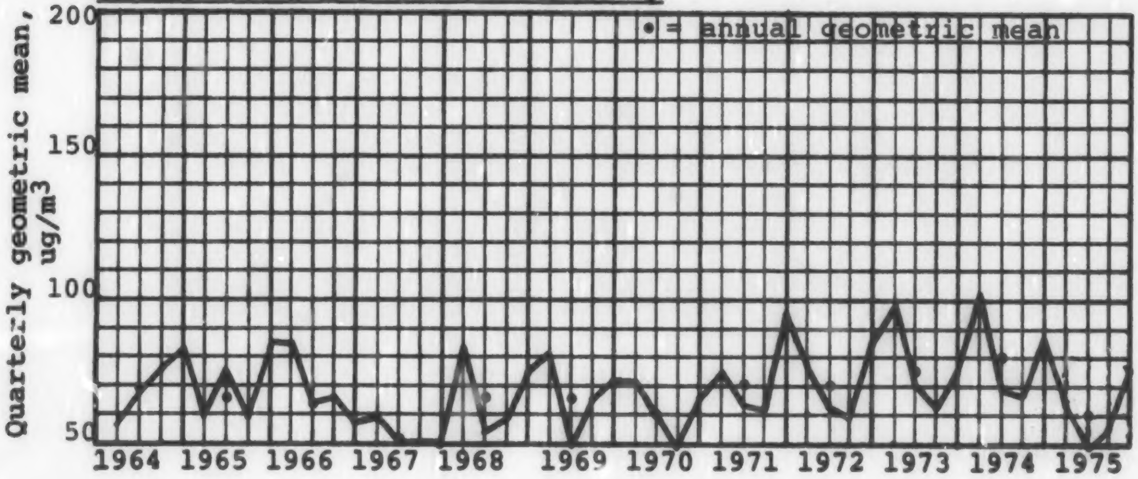
Localized pollution influences - Kipling Street, a major 4 lane highway, runs north-south approximately 300 feet east of the sampler and Alameda Avenue (4 lane) runs east-west 300 feet south.

Physical interferences - There are no obstructions or taller buildings in the immediate vicinity which would affect the sampler's performance.

Terrain - The entire microinventory area is composed of gently rolling land with a mean elevation of 5,500 feet msl.

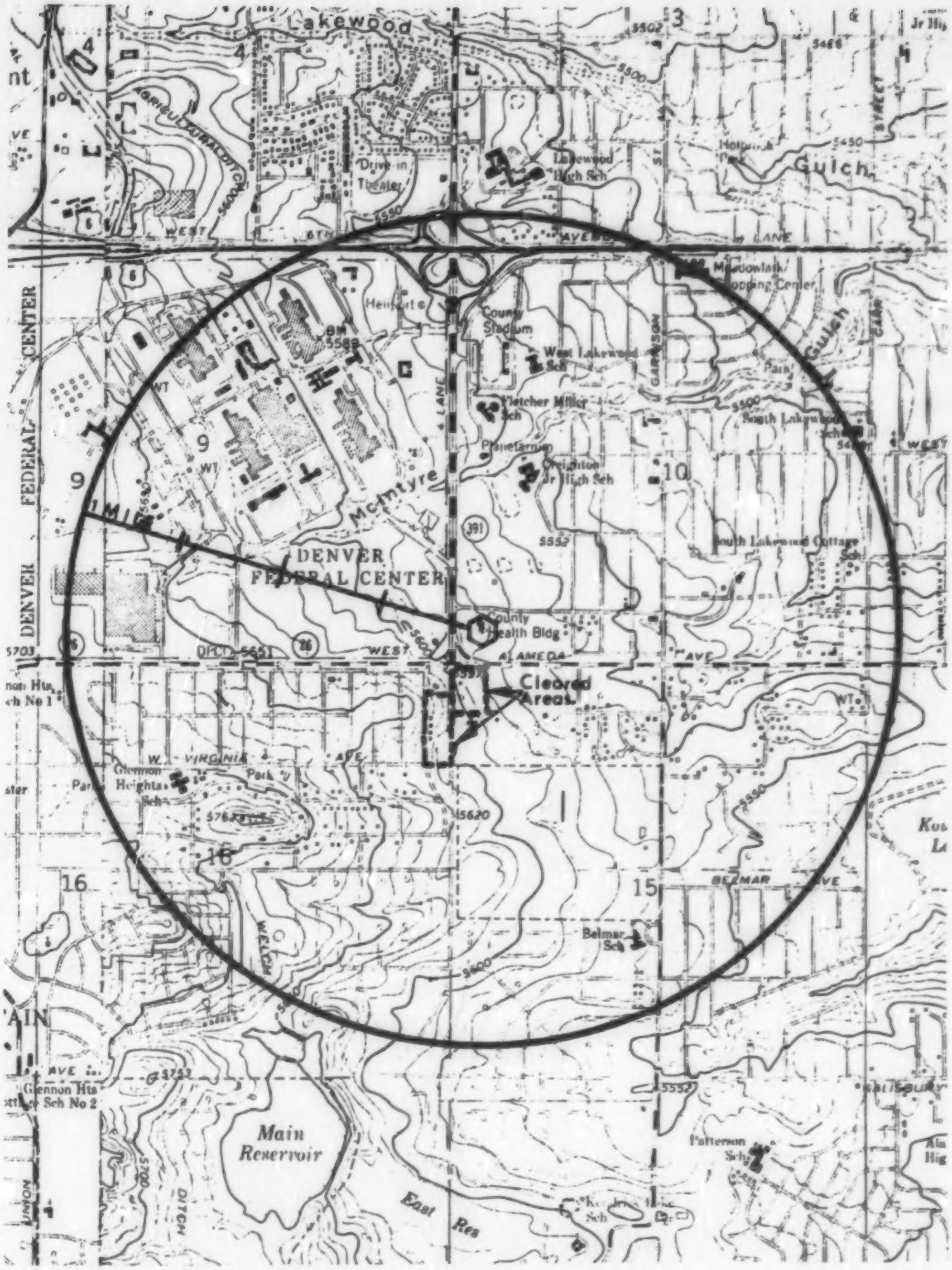
Comments - The sampler appears to represent the air quality in the Lakewood area well.

Trends in Particulate Air Quality



Lakewood sampler viewed to the east.

Lakewood sampler viewed to the north.


Lakewood
Drive in Theater
Lakewood High Sch
Gulch
AGRICULTURAL DITCH
WEST 6TH AVE
Meadowlark Shopping Center
County Stadium
West Lakewood Sch
Fletcher Miller Sch
Planetarium
Creighton Jr High Sch
South Lakewood Sch
South Lakewood Cottage Sch
DENVER FEDERAL CENTER
McIntyre
1 MILE
County Health Bldg
WEST ALAMEDA AVE
Cleared Areas
W. VIRGINIA AVE
Glennon Heights Sch
Park
BELMAR AVE
Belmar Sch
WELCH DITCH
Main Reservoir
East Res
Patterson Sch
DENVER FEDERAL CENTER
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16

Lakewood - City-County Health Department.

Sources in Microinventory Area (1 mile radius)

Lakewood

Population = 11,300
VMT = 67,200

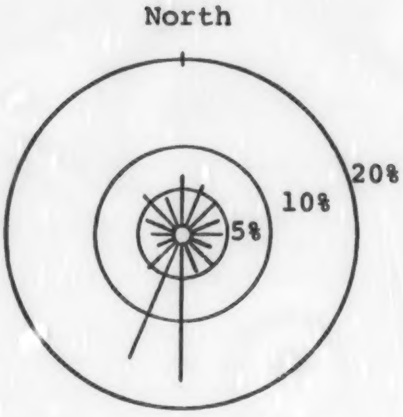
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Area sources:			
Fuel combustion	From AQMA emission inventory report, 2.2% of county pop		79
Other mobile			7
Motor vehicle exhaust	67200 VMT/day	0.59 g/VMT	16
Fugitive dust sources:			
Unpaved roads	1.2 mi, 50 ADT	3.5 lb/VMT	38
Unpaved shoulders	2.3 mi	0.62 t/ac/yr	3
Paved roads	67200 VMT/day	3.5 g/VMT	95
Road sanding	From APCD analysis		70
Cleared areas	23 ac	0.59 t/ac/yr	14
Playgrounds	2.5 ac	0.62 t/ac/yr	2
Total emissions, ton/yr			324
Emission density, ton/sq mi/yr			103
Percent fugitive dust			69

Meteorological Data

Average annual
wind speed = 10.0 mph

Annual precipitation -
1974 = 14.03"
1975 = 15.51"
Normal = 15.51"

No. of days
with precipitation = 84



Stapleton Airport - 1% calm

Maximum Recorded Concentrations

1974 = 348 ug/m^3; 1975 = 234 ug/m^3

Summary and Conclusions

The Lakewood site has historically had annual mean concentrations less than the primary standard, except in 1974 when the mean was 80 ug/m^3. In 1975, the annual mean was only 60 ug/m^3. The microinventory of the survey area did not disclose any significant point sources and revealed relatively low traffic and population densities. The emission density was estimated to be 103 ton/sq mi/yr, which compares well with the measured ambient concentration of 60 ug/m^3.

The site evaluation showed no physical interferences or nearby sources that might bias the readings. All data seemed to indicate that this site was well below the concentration of primary standard and had experienced atypically high pollutant levels in 1974.

3.12 LITTLETON-CENTENNIAL WELLS
SAROAD Site No. 06-1420-002

Description

General site description - The sampler is located on the roof of a pumping station building (West Boules and Santa Fe) about 15 feet above ground level. It is in the middle of a large field and is immediately surrounded by sparsely vegetated open land.

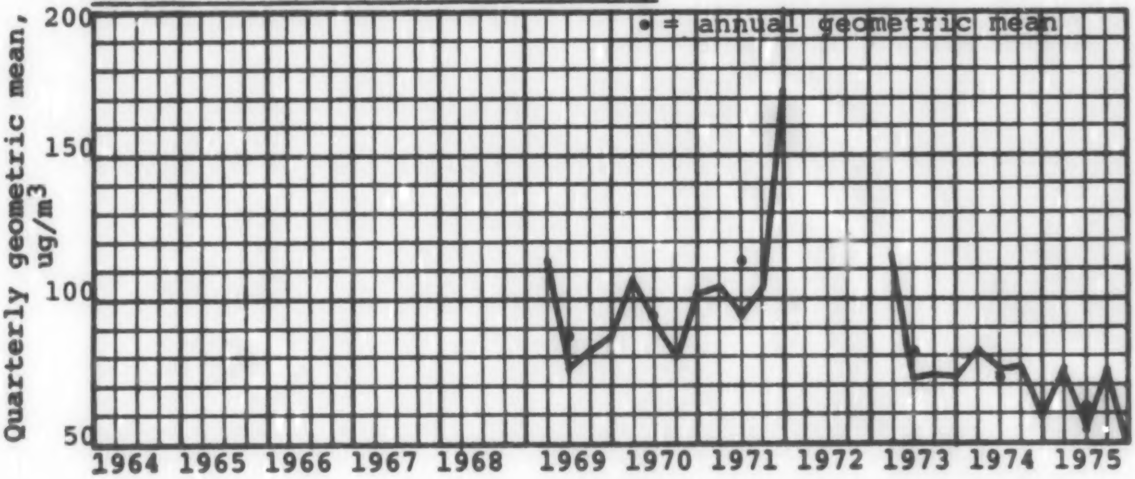
Localized pollution influences - An unpaved road (15 feet wide) passes directly next to the building. It is an access road to the rear of a dirt race track, approximately 1/4 mile north, but does not appear to have any regular traffic. All the land in the immediate vicinity is open and a possible source of wind blown fugitive dust.

Physical interferences - There are no interfering obstructions or buildings in the immediate vicinity of the sampler.

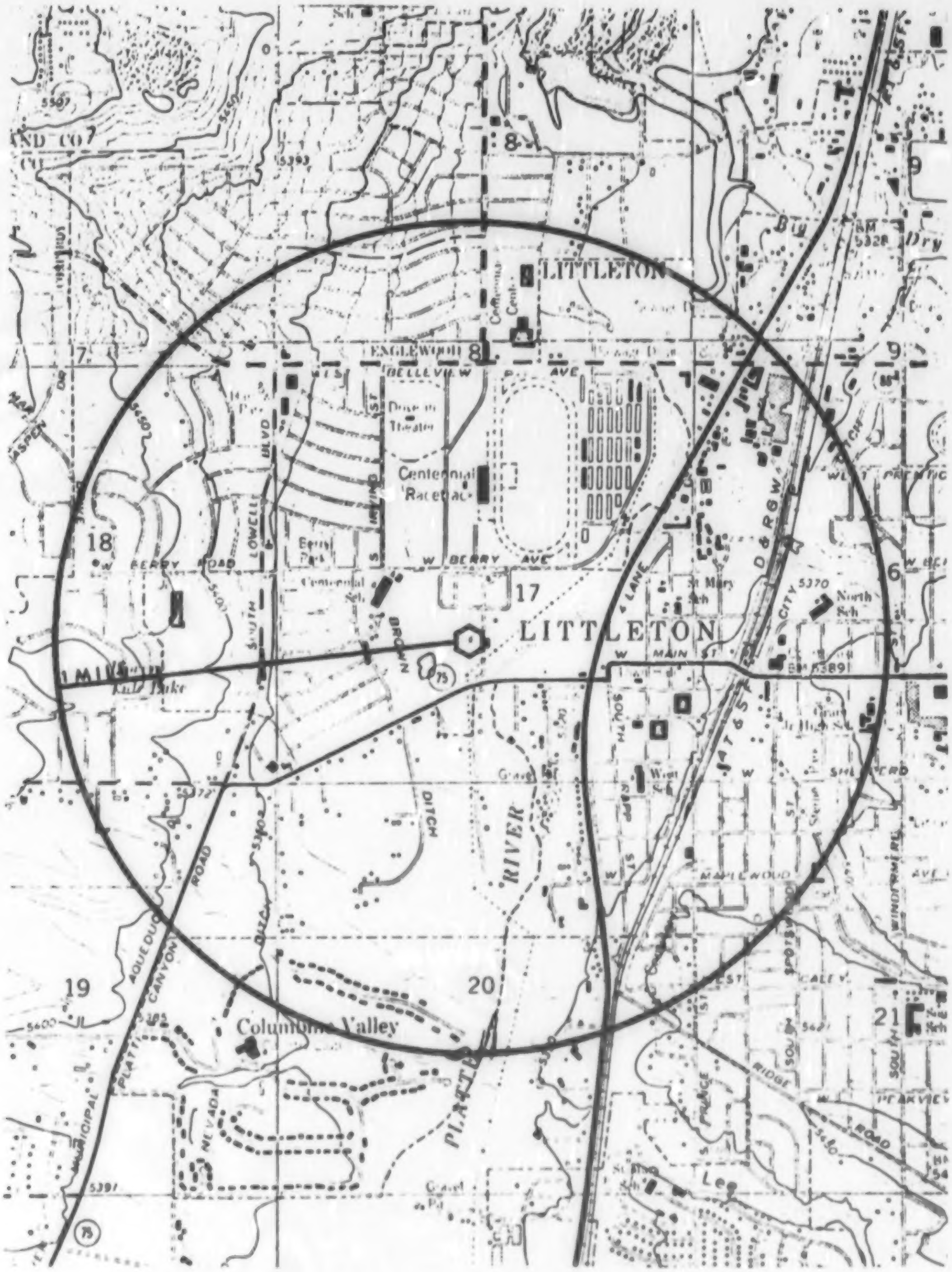
Terrain - The immediate sampler area and a 1/4 mile wide swath extending north-south through the middle of the 1 mile radius area is flat, while the land is rolling to either side. The mean elevation is about 5,350 feet msl.

Comments - The area within a 1/2 mile radius of the sampler is subject to wind erosion and probably high particulate emissions. The peripheral residential areas are clean and the streets are swept. The sampler location is not particularly biased, but it probably has higher than average concentration in the Littleton area.

Trends in Particulate Air Quality



Littleton sampler viewed to the north.


LITTLETON
LITTLETON
ENGLEWOOD
BELLEVIEW AVE
Drive in Theater
Centennial Racetrack
W BERRY AVE
BERRY ROAD
Berry Park
Centennial Sch
St Mary Sch
North Sch
W MAIN ST
1 MILE
Ketl Lake
BROWN DITCH
PLATTE RIVER
PLATTE CANYON ROAD
AQUEDUCT
MUNICIPAL
D&RGW
MAPLEWOOD
Columbine Valley
NEVADA
RIDGE ROAD
Lee
5370
5391
5328
5600
7
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17
18
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20
21
75

Littleton-Centennial Wells.

Sources in Microinventory Area (1 mile radius)

Littleton

Population = 6,100
VMT = 78,000

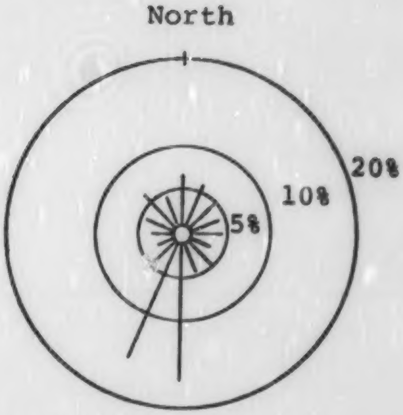
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Ligault Fertilizer			neg
Electron Corporation			neg
Area sources:			
Fuel combustion	From AQMA emission inventory report, 3.8% of county pop		25
Other mobile			3
Motor vehicle exhaust	78000 VMT/day	0.59 g/VMT	19
Fugitive dust sources:			
Unpaved roads	1.9 mi, 10 ADT	3.5 lb/VMT	12
Unpaved shoulders	15 ac	0.62 t/ac/yr	9
Paved roads	78000 VMT/day	3.5 g/VMT	110
Road sanding	From APCD analysis		52
Unpaved parking lots	47 ac	1.4 lb/VMT	27
Construction	40 ac, 4 mo	0.62 t/ac/mo	100
Cleared areas	77 ac	0.31 t/ac/yr	24
RR yards and right-of-way	26 ac	0.7 t/ac/yr	18
Playgrounds	3 ac	0.62 t/ac/yr	2
Total emissions, ton/yr			401
Emission density, ton/sq mi/yr			128
Percent fugitive dust			88

Meteorological Data

Average annual
  wind speed = 10.0 mph

Annual precipitation -
    1974 = 14.03"
    1975 = 15.51"
  Normal = 15.51"

No. of days
  with precipitation = 84



Stapleton Airport - 1% calm

Maximum Recorded Concentrations

1974 = 200 ug/m^3; 1975 = 245 ug/m^3

Summary and Conclusions

The Littleton site has shown a distinct downtrend in annual mean concentrations during the past five years. In both 1974 and 1975, the short-term and annual readings were lower than the respective primary standards. The microinventory survey showed that paved roads and construction, both fugitive dust sources, were the major contributors. Emission density in the survey area was estimated to be 128 ton/sq mi/yr, a value consistent with the 1975 annual geometric mean of 62 ug/m^3.

The sampler is located atop a small building in the middle of a large open area with sparse vegetation. It is not possible to quantify the effect of this exposure on readings, but it would appear to bias the measurements upward compared to other possible site locations in the Littleton area. All available information indicates that this site and the surrounding area which it represents have already attained the primary standard.

3.13 LONGMONT-CITY HALL

SAROAD Site No. 06-1460-001

Description

General site description - The sampler is located on the roof of City Hall (Fourth and Kimbart) about 30 feet above ground level. The local area is commercially developed.

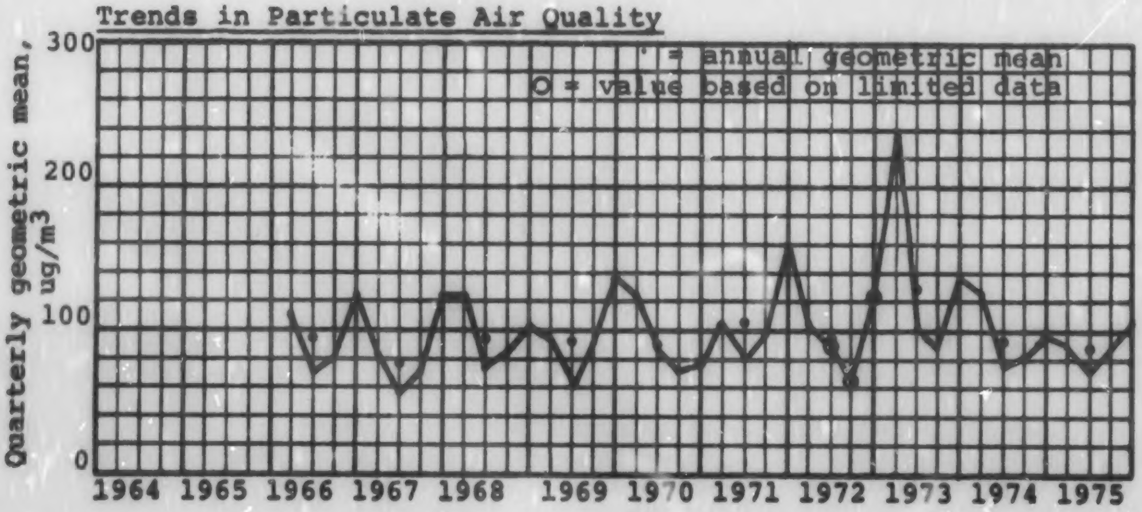
Localized pollution influences - A few furnace vents are located on the roof, while new construction is occurring at a new city complex directly southeast of the sampler. All streets are sanded and dirty.

Physical interferences - Various roof projections exist in proximity to the sampler, which is surrounded on three sides by a 3 foot high ledge or roof parapet.

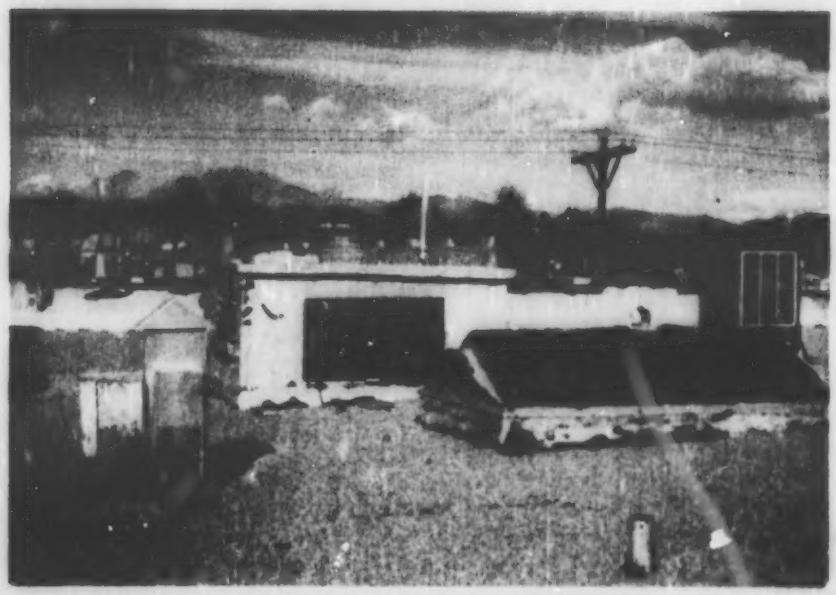
Terrain - The entire area in general is quite flat. Many buildings in this central business district are lower in height than this one. In the south and west sectors of the 1 mile radius area, rolling hills predominate. There is a high level of agriculture surrounding the city.

Comments - There is a high probability that the measurements of air quality obtained are biased due to the roof obstructions close to the sampler; however, it is located well within the city of Longmont and would be representative of air quality in the central business district if not influenced by the roof obstructions.

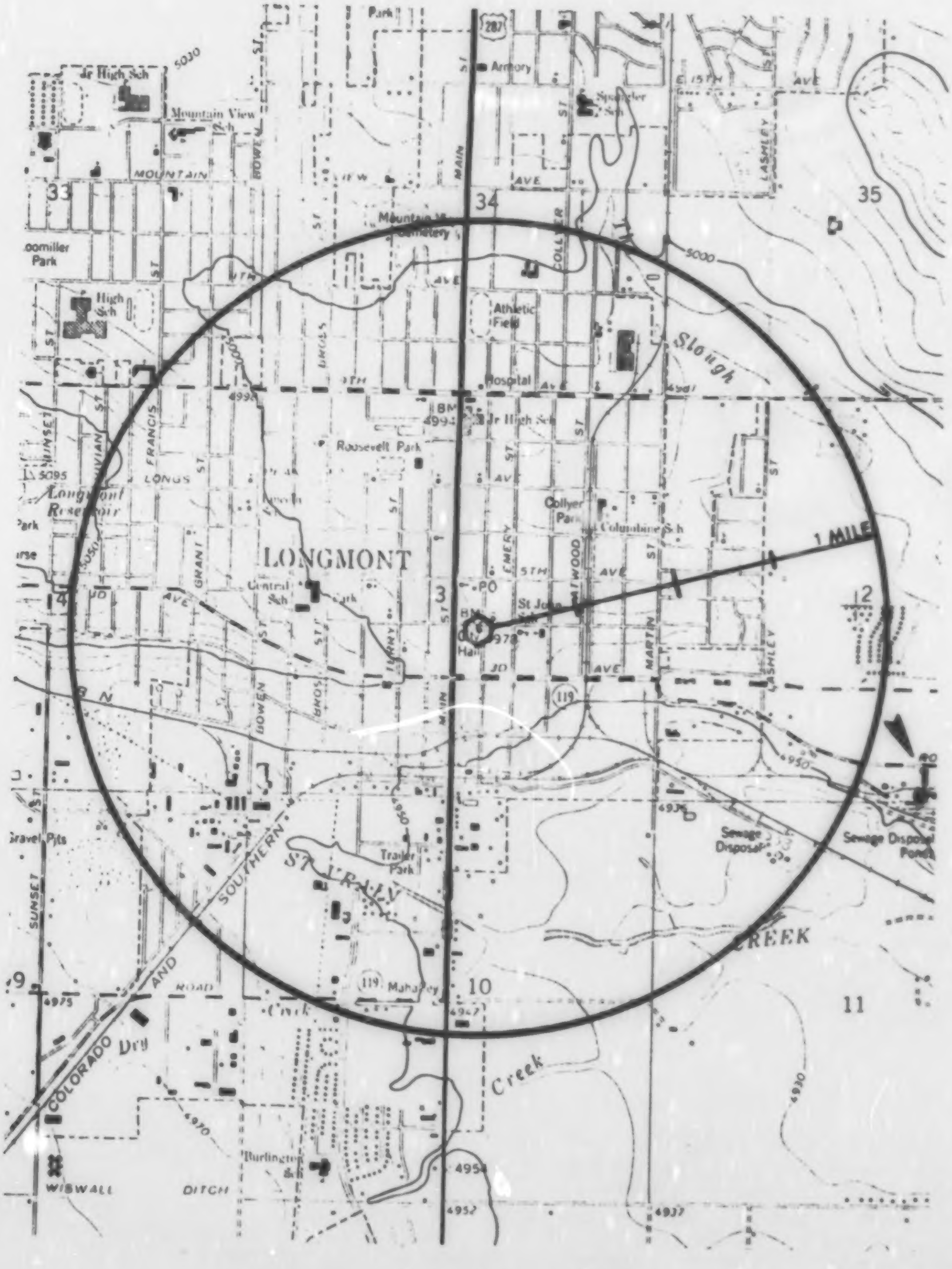
Trends in Particulate Air Quality



Longmont sampler viewed to the south.



Longmont sampler viewed to the west-northwest.


LONGMONT
1 MILE
Jr High Sch
Mountain View Sch
MOUNTAIN
High Sch
Loomiller Park
Armory
Spangler Sch
Mountain View Cemetery
Athletic Field
Hospital
Jr High Sch
Roosevelt Park
Collyer Park
Columbine Sch
Central Sch
Longmont Reservoir
Slough
PO
St John
City Hall
MAIN
BOWEN
SUNSET
FRANCIS
GRANT
EMERY
ATWOOD
MARTIN
LASHLEY
COLLYER
LONGS
15TH
5TH
3D
AVE
ST
287
119
33
34
35
3
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9
10
11
Gravel Pits
Trailer Park
Sewage Disposal
Sewage Disposal Ponds
ST VRAIN
CREEK
Creek
Dry Creek
COLORADO AND SOUTHERN
ROAD
Mahaffey
Burlington Sch
WIBWALL
DITCH
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5030
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4950
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4947
4954
4952
4937
5095

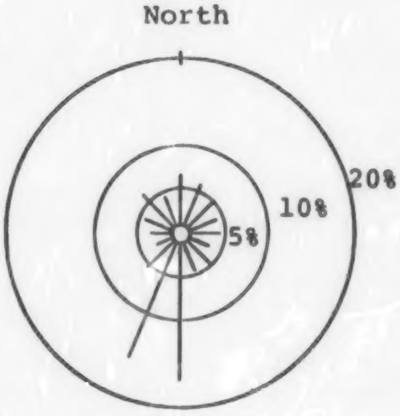
Longmont-City Hall.

Sources in Microinventory Area (1 mile radius)

Longmont

Population = 10,000
VMT = 59,300

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
St. Vrain Block			neg
Slack Hoerner Foundry			neg
Western Foundry			neg
1 Great Western Sugar			46
Co-op Feed			neg
Parma Industries			neg
Golden Gravel			18
Flatiron Paving			16
Golden West Mill			neg
Arapahoe Concrete			neg
Area sources:			
Fuel combustion	From AQMA emission		72
Incineration	inventory report,		neg
Other mobile	7.6% of county pop		5
Motor vehicle exhaust	59300 VMT/day	0.59 g/VMT	14
Fugitive dust sources:			
Unpaved roads	2.7 mi, 20 ADT	3.24 lb/VMT	32
Unpaved shoulders	1.0 mi	0.62 t/ac/yr	1
Paved roads	59300 VMT/day	3.5 g/VMT	84
Unpaved parking lots	20 ac	1.3 lb/VMT	11
Agriculture	99 ac	0.25 t/ac/yr	24
Construction	19 ac, 4 mo	0.62 t/ac/mo	47
Cleared areas	45 ac	0.59 t/ac/yr	26
RR right-of-way	31 ac	0.7 t/ac/yr	22
RR yards	15 ac	0.7 t/ac/yr	11
Aggregate storage	19 ac	10.3 t/ac/yr	195
Total emissions, ton/yr			624
Emission density, ton/sq mi/yr			199
Percent fugitive dust			73



Stapleton Airport - 1% calm

Meteorological Data

Average annual
wind speed = 10.0 mph

Annual precipitation -
1974 = 14.03"
1975 = 15.51"
Normal = 15.51"

No. of days
with precipitation = 84

Maximum Recorded Concentrations

1974 = 563 ug/m^3; 1975 = 390 ug/m^3

Summary and Conclusions

The Longmont site has consistently recorded annual mean concentrations of approximately 100 ug/m^3 over the past 10 years. While the data do exhibit some seasonal variation, this variation is not nearly as great as in the Denver urban area. The estimated emission density of 199 ton/sq mi/yr from the microinventory is less than would be expected with the high measured concentrations. Some nearby construction activity may be temporarily increasing readings, but this would not explain the historically high concentrations. It is possible that, as with the Brighton site, more of the total measurement is due to background in the fringe areas of the Denver AQCR where surrounding land use is agricultural rather than urban or suburban. Thus, a lower emission density from inventoried sources would be required to produce the same ambient concentration as in the central Denver area.

The source category with greatest contribution in the survey area is aggregate storage (31%), followed by paved roads (13%), several point sources (13%), and residential/commercial fuel combustion (12%). Due to the many different contributing sources and the high percentage reduction needed for attainment, emission reductions from many sources would probably be required. A very comprehensive enforcement program for existing fugitive dust regulations might provide the necessary emission reductions.

3.14 GREELEY-CITY COMPLEX
SAROAD Site No. 06-1000-003

Description

General site description - The sampler is situated on the roof of the City Complex/fire station (Sixth Street and Tenth Avenue) about 30 feet above ground level and set back 100 feet from Tenth Avenue. It is in an area composed of light commercial, fringe residential, and park land usage.

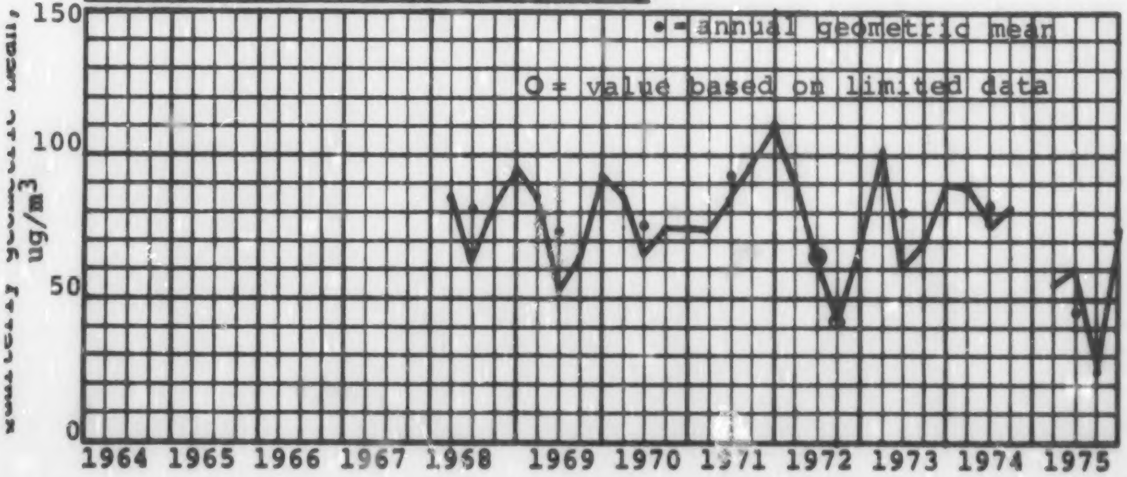
Localized pollution influences - The city streets in the immediate vicinity were very dusty.

Physical interferences - There are some small roof vents and an air conditioning compressor on the roof which would have no apparent effect on the sampler's readings.

Terrain - The site area is flat and consists mainly of developed urban/suburban areas. The mean elevation is about 4,650 feet msl.

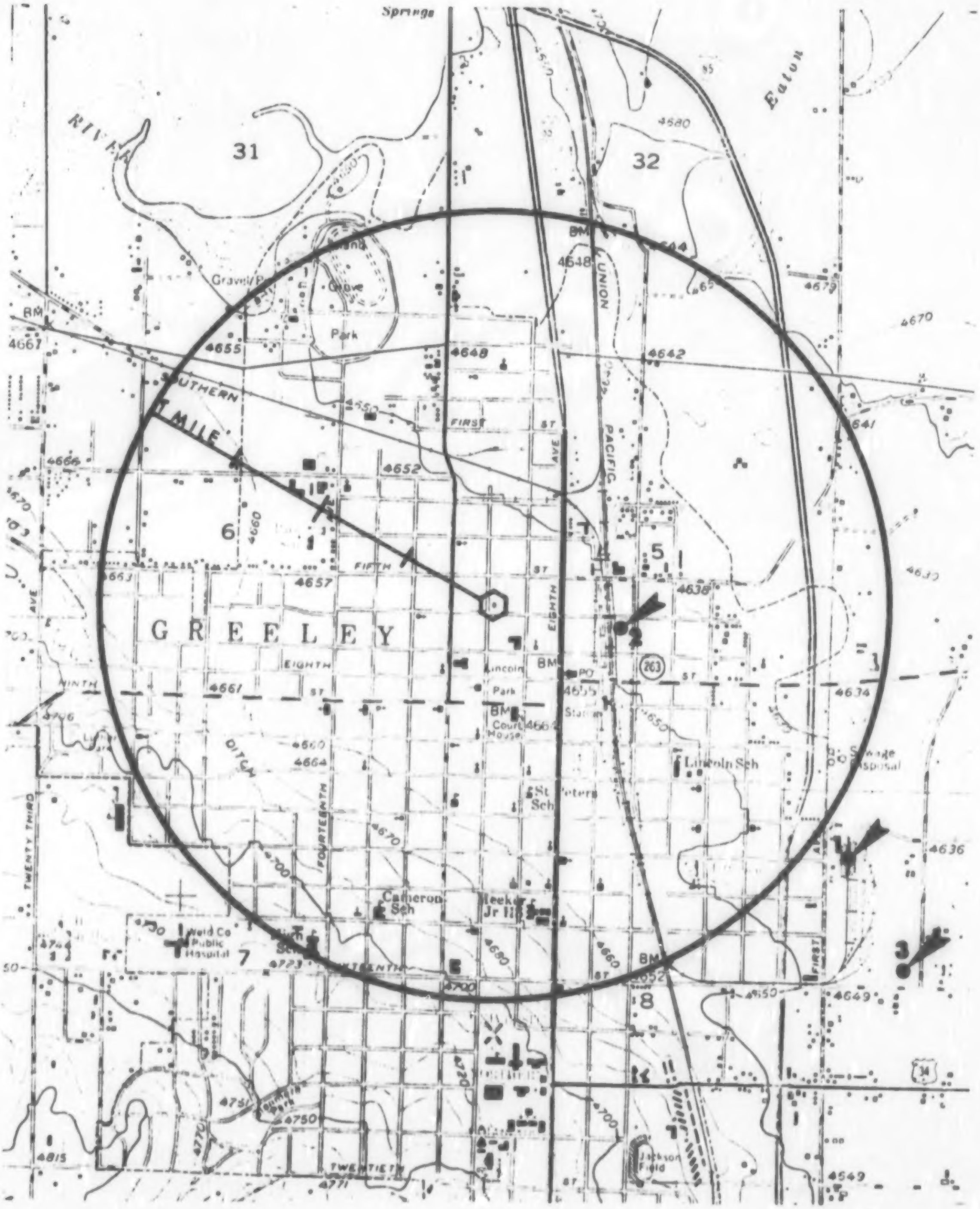
Comments - This sampler is probably yielding a fairly representative picture of ambient air quality in Greeley. It is situated well and is removed from any possible severe localized pollution influences.

Trends in Particulate Air Quality



Greeley-City Complex sampler viewed to the northeast.

Greeley-City Complex sampler viewed to the south.


Springs
RIVER
31
32
Eaton
Gravel Pit
Grove
Park
SOUTHERN
UNION
PACIFIC
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FIFTH ST
EIGHTH ST
NINTH ST
EIGHTH AVE
6
5
GREELEY
Lincoln Park
PO
Court House
Station
Lincoln Sch
St Peters Sch
Sewage Disposal
DITCH
FOURTEENTH
Cameron Sch
Weld Co Public Hospital
7
8
TWENTY THIRD AVE
TWENTIETH
Jackson Field
2
3
263
34
4680
4648
4642
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4648
4650
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4750
4751
4771
4815
4549

Greeley-City Complex.

Sources in Microinventory Area (1 mile radius)

Greeley-City Complex

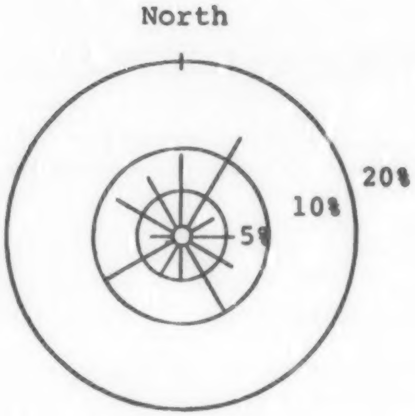
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 Great Western Sugar			98
2 Greeley Elevator			9
3 Farr Farms (feedlot)	Outside mile radius		78
D & D Bean (two locations)			neg
Nuffsinger Mfg			neg
Shank Feed			neg
Wellgro			1
Cowan Concrete			3
Monfort Packing			18
Greeley Sand & Gravel	Outside mile radius		unknown
Flatiron Ready Mix	Outside mile radius		unknown
Area sources:			
Fuel combustion	From AQMA analysis, 54.5% of total emissions in grids 7, 8, 11, and 12		100
Railroad			2
Motor vehicle exhaust	Included under Paved roads		
Fugitive dust sources:			
Unpaved roads	From AQMA analysis		216
Unpaved shoulders	4.8 mi	0.62 t/ac/yr	3
Paved roads, motor vehicle exhaust and sanding	From AQMA analysis		164
Unpaved parking lots	46 ac	1.4 lb/VMT	27
Agriculture	59 ac	0.25 t/ac/yr	14
Construction	From AQMA analysis		3
Cleared areas	62 ac	0.59 t/ac/yr	36
RR right-of-way	14 ac	0.7 t/ac/yr	10
RR yards	46 ac	0.7 t/ac/yr	32
Total emissions, ton/yr			736
Emission density, ton/sq mi/yr			234
Percent fugitive dust			69

Meteorological Data

Average annual
  wind speed = 7.5 mph

Annual precipitation -
    1974 = 11.90"
    1975 = 16.08"
  Normal = 12.20"

No. of days
  with precipitation = 80



Greeley - 0.6% calm
        - 9.8% variable

Maximum Recorded Concentrations

1974 = 227 ug/m^3; 1975 = 139 ug/m^3

Summary and Conclusions

The Greeley-City Complex site had been reading near 80 ug/m^3 annual mean for eight years before recording a value of 46 ug/m^3 in 1975. The estimated emission density determined from the microinventory is 234 ton/sq mi/yr, a value more consistent with the concentrations of about 80 ug/m^3 than the 1975 level. Based on this comparison, the 1975 data are suspect. However, this sampler is operated by the same personnel and the filters are analyzed in the same laboratory as other Weld County sites, which did not exhibit such changes.

The site appears to be well located and not subject to any physical interferences. The source category with the greatest emissions is unpaved roads, but reentrained dust from paved streets and point sources also make substantial contributions. Because this site had only been slightly exceeding the primary standard in previous years, a return to those levels in 1976 would require only a low percentage reduction in emissions for attainment. This could probably be accomplished best by changes in the enforcement of existing fugitive dust control regulations rather than by an SIP revision.

3.15 GREELEY-WASTEWATER TREATMENT PLANT
SAROAD Site No. 06-1000-004

Description

General site description - The sampler is located on the roof of a storage building at the sewage plant (1st Avenue and 10th Street) elevated 15 feet above the ground. It is surrounded by public use property and open land. The plant access road passes within 5 feet of the building.

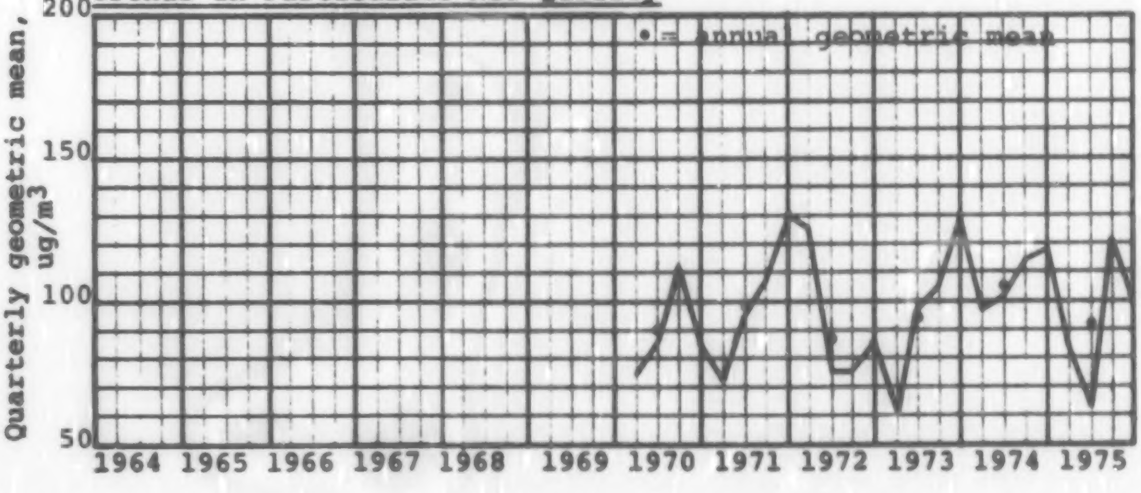
Localized pollution influences - The sampler is fronted on two sides by an unpaved access road and an unpaved parking lot. Directly to the west (200 feet) is a 4 lane heavily travelled highway. There appeared to be a sewage sludge incinerator 100 feet to the southeast.

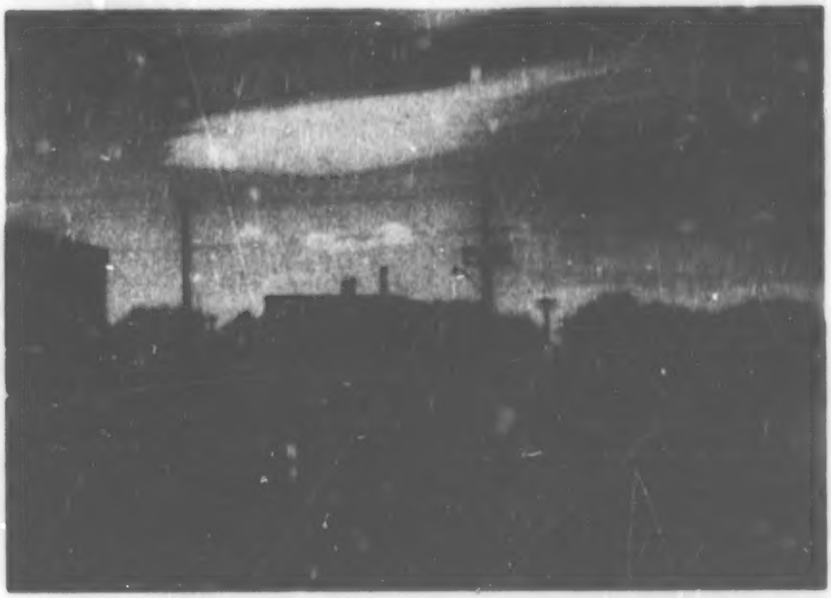
Physical interferences - No obstructions or taller buildings were noted in the vicinity of the sampler which could affect the readings.

Terrain - The site area is flat with much open agricultural land to the east and a large 4 lane highway cutting through its middle, north to south. The mean elevation is about 4,650 feet msl.

Comments - It is possible that this sampler depicts a biased indication of air quality in this area due to the proximity of the unpaved areas and the highway. Generally, the survey area had sanded, uncleaned streets and quite a few fugitive dust sources.

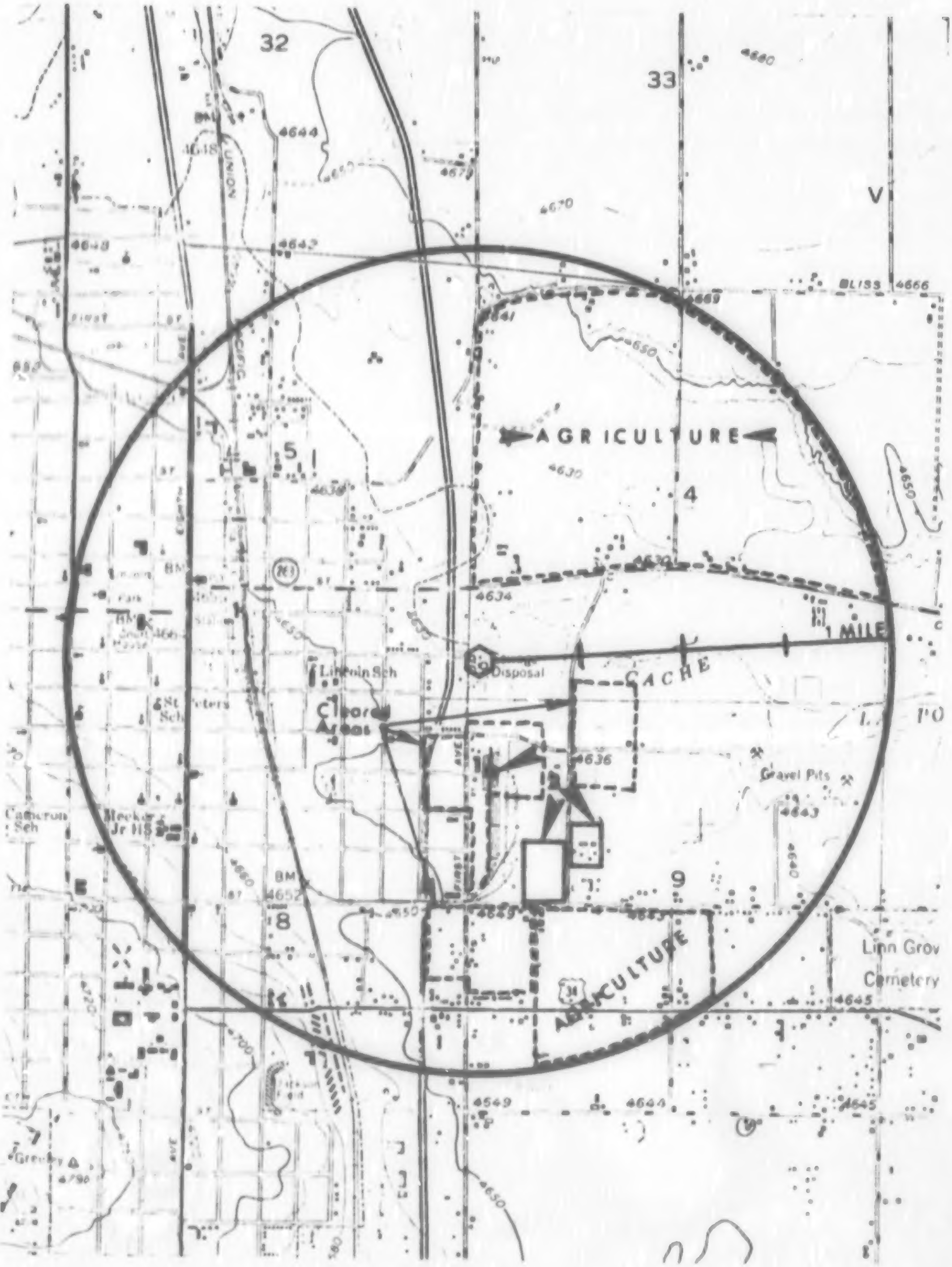
Trends in Particulate Air Quality





Greeley-Wastewater Treatment Plant sampler viewed to the west.

Greeley-Wastewater Treatment Plant sampler viewed to the southeast.


32
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V
AGRICULTURE
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CACHE
Disposal
Cleared Areas
Lincoln Sch
St Peters Sch
Cameron Sch
Meeker Jr HS
Gravel Pits
9
8
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Cemetery
BLISS
Greeley
UNION
PACIFIC
FIRST
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4666
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4643
4644
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4670
4680

Greeley-Wastewater Treatment Plant.

Sources in Microinventory Area (1 mile radius)

Greeley-Wastewater Treatment Plant

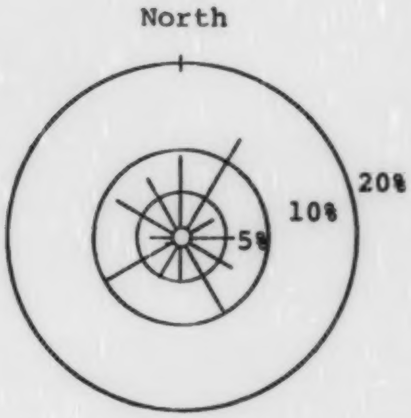
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 Great Western Sugar			98
2 Farr Farms			78
Unnamed elevator			unknown
D & D Bean (two locations)			neg
Nuffsinger Mfg			neg
Greeley Elevator			9
Shank Feed			neg
Wellgro			1
Cowan Concrete			3
Area sources:			
Fuel combustion	From AQMA analysis, 54.5% of total emissions in grids 8, 9, 12, and 13		80
Railroad			1
Motor vehicle exhaust	Included under Paved roads		
Fugitive dust sources:			
Unpaved roads	From AQMA analysis		306
Unpaved shoulders	5.3 mi	0.62 t/ac/yr	3
Paved roads, motor vehicle exhaust and sanding	From AQMA analysis		87
Unpaved parking lots	59 ac	1.4 lb/VMT	34
Agriculture	470 ac	0.25 t/ac/yr	115
Construction	From AQMA analysis		6
Cleared areas	85 ac	0.59 t/ac/yr	50
RR right-of-way	21 ac	0.7 t/ac/yr	15
RR yards	34 ac	0.7 t/ac/yr	24
Total emissions, ton/yr			910
Emission density, ton/sq mi/yr			290
Percent fugitive dust			70

Meteorological Data

Average annual
wind speed = 7.5 mph

Annual precipitation -
1974 = 11.90"
1975 = 16.08"
Normal = 12.20"

No. of days
with precipitation = 80



Greeley - 0.6% calm
- 9.8% variable

Maximum Recorded Concentrations

1974 = 606 ug/m^3; 1975 = 305 ug/m^3

Summary and Conclusions

This site in Greeley has not shown any distinct long-term trend or seasonal pattern over the past six years. Both the 24-hour and annual primary standards have been exceeded each year. The microinventory shows several source categories with a significant impact, including unpaved roads, agriculture, point sources, and residential/commercial fuel combustion. Fugitive dust area sources account for approximately 70 percent of the total emissions in the survey area.

The emission density is estimated to be 290 ton/sq mi/yr, which agrees well with the annual mean of 91 ug/m^3. However, the site survey revealed an apparent strong bias to the readings due to the presence of an unpaved road and parking lot adjacent to the sampler, as shown in the photographs. More comprehensive enforcement of existing fugitive dust regulations might result in attainment at this site, but the site should probably be moved to a more representative location rather than requesting an SIP revision in this AQCR.

3.16 LOVELAND-LARIMER COUNTY BUILDING
SAROAD Site No. 06-1480-002

Description

General site description - The sampler is located on the roof of the Larimer County Building (211 East Fourth, NE) about 40 feet above ground level. It is located in the central business district of town.

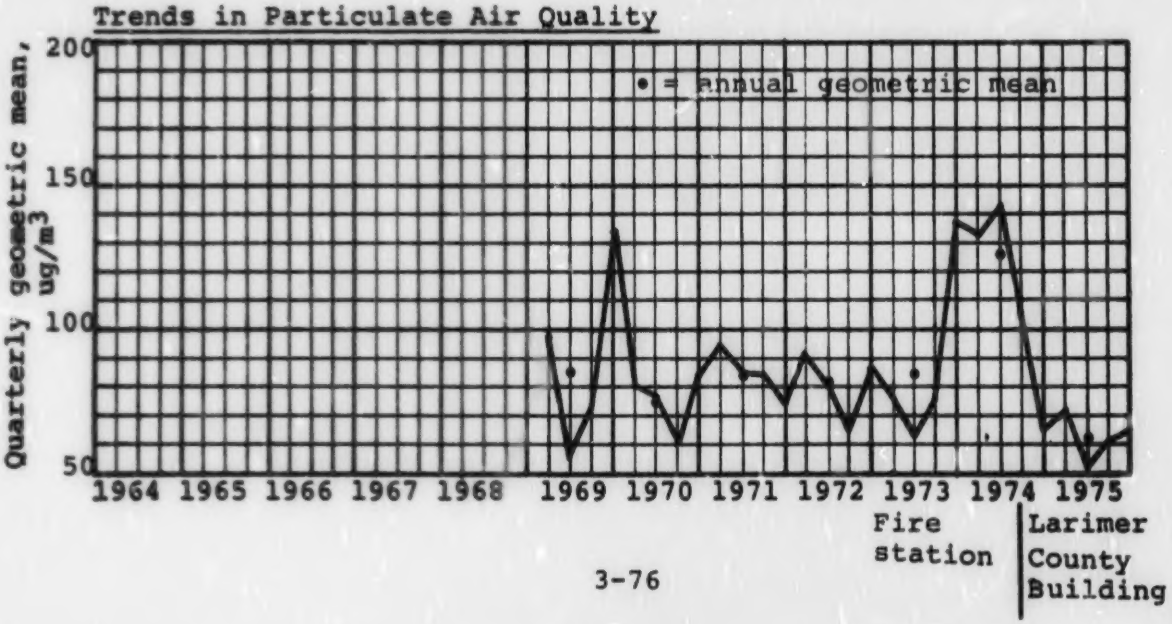
Localized pollution influences - There are no major influential sources in proximity to the sampler with the exception of traffic.

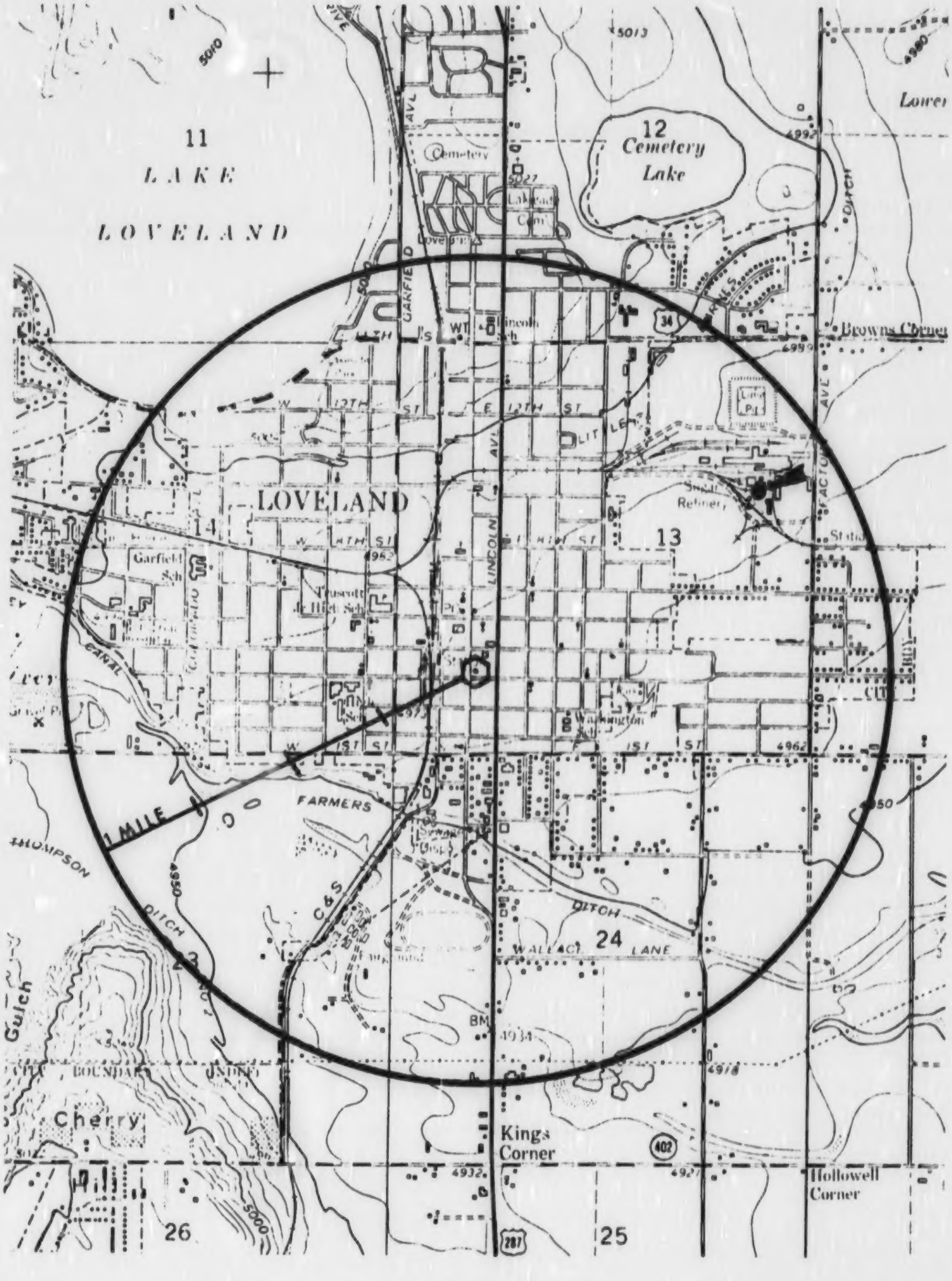
Physical interferences - The sampler is not visibly obstructed by any roof structures. There are no buildings in the vicinity that are taller.

Terrain - The immediate and surrounding terrain is flat with a mean elevation of 5,000 feet msl. Lake Loveland borders the northwest edge of the 1 mile radius area. There is a canal and associated depression in the south central part of the area.

Comments - Overall, area streets are sanded and were dirty on the edges at the time of the survey. The sampler was moved from 410 East Fifth Street in the fourth quarter of 1974. The present site is three blocks from the old one. The sampler probably obtains a representative sample of ambient air in this area.

Trends in Particulate Air Quality




11
LAKE LOVELAND
12
Cemetery Lake
Lower
Cemetery
Browns Corner
LOVELAND
14
13
Sugar Refinery
Garfield Sch
Truscott Jr High Sch
Washington Sch
1 MILE
FARMERS
THOMPSON
DITCH
CANAL
C&S
24
23
WALLACE LANE
LINCOLN AVE
GARFIELD
Gulch
Cherry
CITY BOUNDARY
Kings Corner
Hollowell Corner
26
25
287
402
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5010
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4992
4990
4962
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4934
4918
4932
4927
5000
BM

Loveland-Larimer County Building.

Sources in Microinventory Area (1 mile radius)

Loveland

Population = 12,900
VMT = 55,100

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 Great Western Sugar			33
Loveland Packing			1
Flatiron Paving			16
Area sources:			
Fuel combustion	From AQMA emission inventory report, 14.3% of county pop		62
Incineration			neg
Other mobile			10
Motor vehicle exhaust	55100 VMT/day	0.59 g/VMT	13
Fugitive dust sources:			
Unpaved roads	1.9 mi, 10 ADT	3.1 lb/VMT	11
Unpaved shoulders	2.3 mi	0.62 t/ac/yr	3
Paved roads	2.9% of county VMT (1346 t/yr)		39
Unpaved parking lots	30 ac	1.24 lb/VMT	15
Agriculture	116 ac	0.3 t/ac/yr	35
Cleared areas	40 ac	0.59 t/ac/yr	24
RR right-of-way	24 ac	0.7 t/ac/yr	17
RR yards	15 ac	0.7 t/ac/yr	11
Aggregate storage	4 ac	10.3 t/ac/yr	41
Gravel pits/quarries	7 ac	10.3 t/ac/yr	72
Playgrounds	4 ac	0.62 t/ac/yr	2
Total emissions, ton/yr			405
Emission density, ton/sq mi/yr			129
Percent fugitive dust			67

Meteorological Data

No local data available.

Maximum Recorded Concentrations

1974 = 429 ug/m^3; 1975 = 223 ug/m^3

Summary and Conclusions

The Loveland site was located at a fire station in the central business district for six years, where it usually recorded annual mean concentrations slightly above the primary standard (except for the 127 ug/m^3 reading in 1974). However, this station was removed from the network at the end of 1974 and replaced by a site three blocks away at the Larimer County Building. At this new location, the 1975 annual geometric mean was 62 ug/m^3, well below the primary standard.

According to the microinventory for the new site, there are no sources or source categories with a major impact on the sampler. The estimated emission density is 129 ton/sq mi/yr, which checks with the ambient concentration of 62 ug/m^3 and indicates that the former site may have been affected by local source biases. No localized influences were identified at the new site. Based on the 1975 air quality data and microinventory results, the Loveland area does not exceed the particulate primary standards.

3.17 STERLING-MAJESTIC SAVINGS AND LOAN
SAROAD Site No. 06-0800-001

Description

General site description - The sampler is located on the roof of the Majestic Savings and Loan building (South Third and Ash) about 20 feet above ground level. It is set back 30 feet from Third Street. The immediate area is the commercial district of town; the periphery of the survey area is residential and open land.

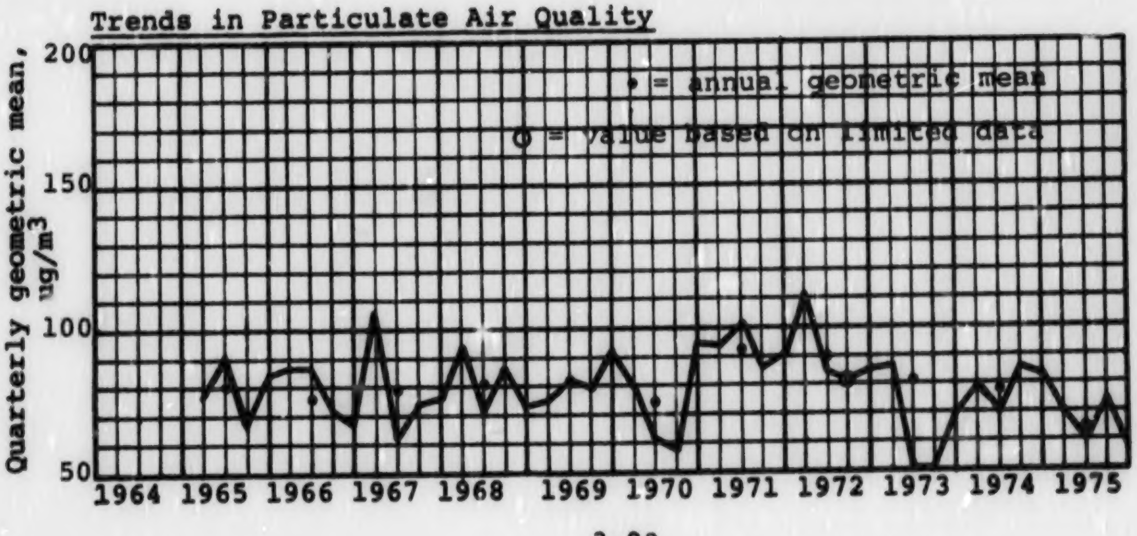
Localized pollution influences - There is a roof vent and an air conditioning compressor 50 feet from the sampler. The adjacent streets are clean.

Physical interferences - The walls of the adjacent buildings 50 feet to the southeast and northeast of the sampler extend above it about 20 feet. No other obstructions are in close proximity.

Terrain - The immediate and surrounding terrain is flat with a mean elevation of approximately 3,930 feet msl.

Comments - The downtown area in proximity to the sampler is generally clean. The streets were sanded and not swept at the time of the survey. The area contained many cleared areas subject to wind erosion. The soil is very sandy.

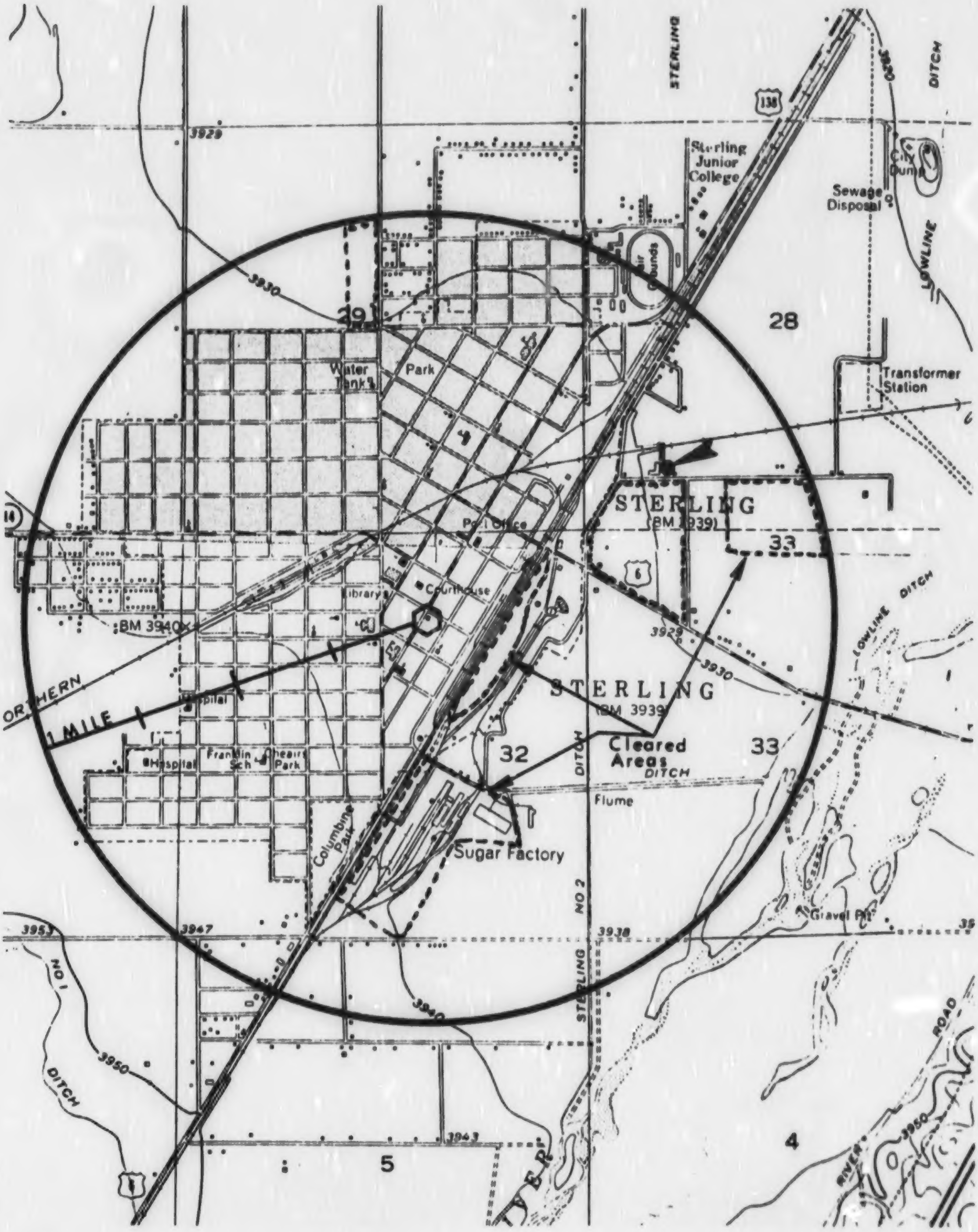
Trends in Particulate Air Quality



Sterling sampler viewed to the south.

Security Bank
Majestic Savings

Sterling sampler viewed to the northeast.


STERLING
DITCH
LOWLINE
138
3929
Sterling Junior College
Sewage Disposal
City Dump
Fair Grounds
3930
29
28
Water Tank
Park
Transformer Station
14
STERLING
(BM 3939)
33
Post Office
6
Courthouse
Library
BM 3940
NORTHERN
1 MILE
Hospital
Franklin Sch
Sheaire Park
Hospital
STERLING
(BM 3939)
3929
3930
LOWLINE DITCH
32
Cleared Areas
33
DITCH
Flume
Columbine Park
Sugar Factory
Gravel Pit
3953
3947
3938
NO 1
DITCH
3950
3940
STERLING NO 2 DITCH
3943
5
4
RIVER ROAD
3950

Sterling-Majestic Savings and Loan.

Sources in Microinventory Area (1 mile radius)

Population = 10,000
Sterling VMT = 31,400

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Agri Chem			neg
Lebsacks Feed & Seed			neg
Great Western Sugar			8 (est)
D & C Bean			6 (est)
Trinidad Bean & Elev			24 (est)
Farr Feeds			neg
1 Farr Feedlot	9 ac	3.0 t/ac/yr	27
McAtee-Renquist	Outside mile radius		neg
Nutrena Feeds			neg
Area sources:			
Fuel combustion	From TRW inventory report, 53% of county pop		20
Other mobile			4
Motor vehicle exhaust	31400 VMT/day	0.59 g/VMT	7
Fugitive dust sources:			
Unpaved roads	3.3 mi, 20 ADT	3.6 lb/VMT	43
Unpaved shoulders	5.7 mi	1.84 t/ac/yr	24
Paved roads	31400 VMT/day	3.5 g/VMT	44
Unpaved parking lots	35 ac	1.43 lb/VMT	21
Agriculture	10 ac	0.3 t/ac/yr	3
Cleared areas	153 ac	1.75 t/ac/yr	268
RR right-of-way	24 ac	2.1 t/ac/yr	50
RR yards	41 ac	2.1 t/ac/yr	86
Playgrounds	5 ac	1.84 t/ac/yr	9
Total emissions, ton/yr			644
Emission density, ton/sq mi/yr			205
Percent fugitive dust			85

Meteorological Data

No local data available.

Maximum Recorded Concentrations

1974 = 231 ug/m^3; 1975 = 307 ug/m^3

Summary and Conclusions

The Sterling site recorded annual means slightly above the primary standard for its entire 10 year history prior to 1975. In 1975, the annual mean fell to 65 ug/m^3. With an estimated emission density of 205 ug/m^3, the comparable air quality should be in the range of 65 to 80 ug/m^3, so this determination does not aid in deciding whether the Sterling site has attained the standards or experienced atypically low concentrations in 1975.

The indicated major contributing sources at this site are somewhat unusual--cleared areas (42%) and railroad yards and right-of-ways (21%). Fugitive dust sources account for approximately 85 percent of emissions in the survey area. If minor emission reductions would be necessary to permanently attain the standards based on subsequent air quality data, they could probably be best achieved by more thorough enforcement of existing fugitive dust regulations rather than by an SIP revision.

There do not appear to be any localized influencing sources near the sampler.

3.18 WINDSOR-FIRE STATION
SAROAD Site No. 06-2220-003

Description

General site description - The sampler is located on the roof of the Windsor Fire Station on Main Street, approximately 20 feet above ground level. It is set back about 50 feet from Main Street (a 4 lane road). The surrounding area is zoned residential, light commercial, and agricultural.

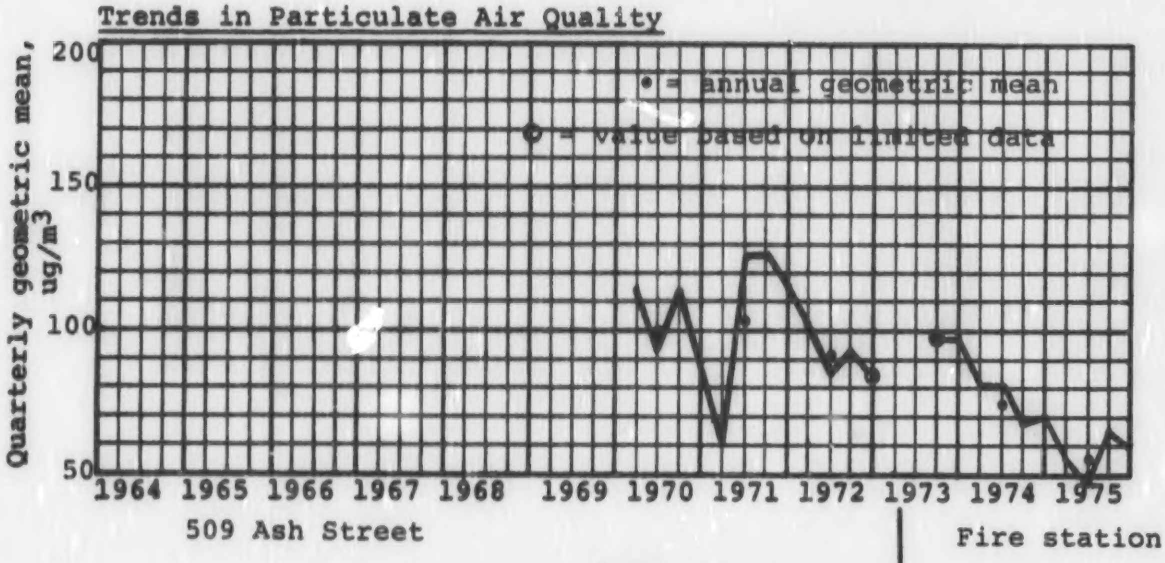
Localized pollution influences - Directly to the east and immediately adjacent to the sampler there are about 3 acres under construction (building). The area in the rear of the fire station is unpaved and to the north (300 feet) lies a plowed field. Main Street in front of the sampler appears clean.

Physical interferences - No major obstructions were noted in the immediate vicinity of the sampler. There were no taller buildings in the immediate area.

Terrain - The site area is completely flat with a lake and agriculture comprising about 75 percent of the surface area. There are no predominant features. The mean elevation is approximately 4,800 feet.

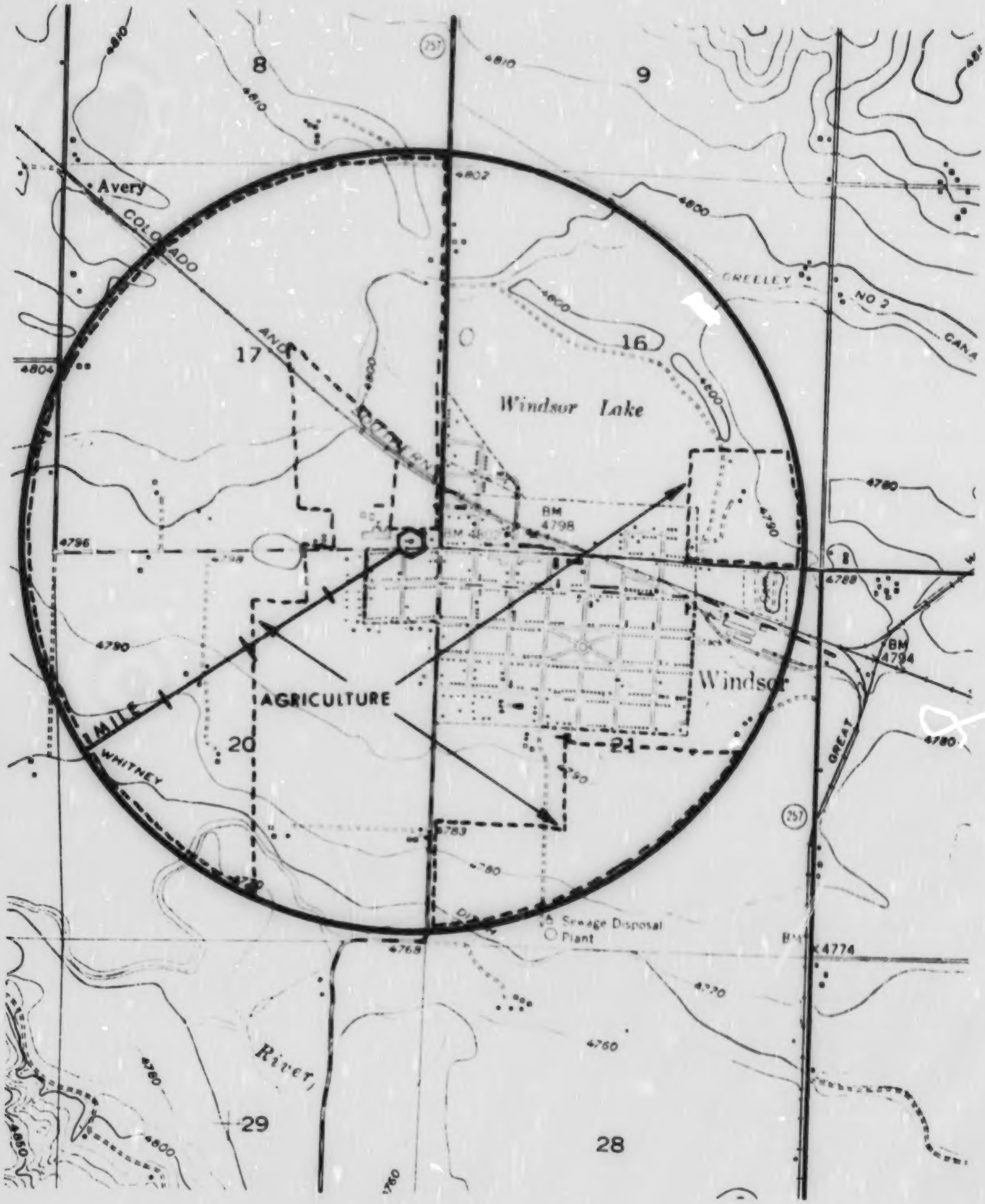
Comments - This site appears to be biased by many localized interfering fugitive dust sources and may not be completely representative of air quality in Windsor. The streets in the area appeared to be swept but were still sandy and dirty at the time of the survey. This sampler was moved from 509 Ash Street during 1973. The former site was about 2 blocks from the present one.

Trends in Particulate Air Quality



Windsor sampler viewed to the north.

Windsor sampler viewed to the south.


8
9
4810
257
Avery
COLORADO AND
4802
4800
GREELEY NO 2 CANAL
16
17
Windsor Lake
4804
BM 4798
4796
4780
4788
4790
BM 4794
Windsor
AGRICULTURE
1 MILE
WHITNEY
20
21
GREAT
257
4783
4780
Sewage Disposal Plant
4768
BM 4774
4770
River
4760
29
28
4800
4850

Windsor-Fire Station.

Sources in Microinventory Area (1 mile radius)

Windsor

Population = 1,735
VMT = 11,900

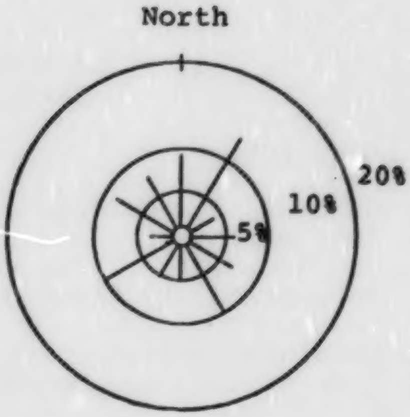
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Windsor Elevator			neg
Cowan Concrete			3
Western Alfalfa			31
Kerr Elevator			neg
Area sources:			
Fuel combustion	From AQMA emission inventory report, 2.0% of county pop		8
Other mobile			2
Motor vehicle exhaust	11900 VMT/day	0.59 g/VMT	3
Fugitive dust sources:			
Unpaved roads	3.9 mi, 20 ADT	3.5 lb/VMT	43
Unpaved shoulders	0.5 mi	0.62 t/ac/yr	1
Paved roads	0.5% of county VMT (1837 t/yr)		9
Unpaved parking lots	13 ac	1.4 lb/VMT	8
Agriculture	1000 ac	1.55 t/ac/yr 0.99 t/ac/yr, tilling	245
Cleared areas	42 ac	0.59 t/ac/yr	25
RR right-of-way	11 ac	0.7 t/ac/yr	8
RR yards	2 ac	0.7 t/ac/yr	1
Playgrounds	5 ac	0.62 t/ac/yr	3
Total emissions, ton/yr			390
Emission density, ton/sq mi/yr			124
Percent fugitive dust			88

Meteorological Data

Average annual
wind speed = 7.5 mph

Annual precipitation -
1974 = 11.90"
1975 = 16.08"
Normal = 12.20"

No. of days
with precipitation = 80



Greeley - 0.6% calm
- 9.8% variable

Maximum Recorded Concentrations

1974 = 1048, second high = 170 ug/m^3
1975 = 208 ug/m^3

Summary and Conclusions

The sampler in Windsor recorded annual mean concentrations around 100 ug/m^3 for three years in the early 1970's. The site was temporarily shut down and then resumed operation in late 1973 at its present location on the fire station building. The annual geometric means for 1974 and 1975 were 75 and 56 ug/m^3, respectively, neither above the primary standard. The high 24-hour reading of 1048 ug/m^3 in 1974 was obtained on a day with 15-26 knot winds recorded in Denver and 22-40 knot winds in Cheyenne. If this sample were eliminated from the 1974 data, the annual mean would be reduced to 73 ug/m^3.

The estimated emission density of 124 ton/sq mi/yr appears to be consistent with the relatively low readings measured in 1975. The only major contributor to the ambient concentrations was shown to be agriculture (63%).

A large construction site immediately adjacent to the sampler is undoubtedly biasing the current readings, as shown in the photographs. This interference is temporary, but other nearby fugitive dust sources are probably more permanent. Therefore, even if the site were to exceed the standards in the future, it could be attributed to siting bias rather than high pollutant concentrations in Windsor.

3.19 LA SALLE-VOLUNTEER FIRE DEPARTMENT
SAROAD Site No. 06-2220-004

Description

General site description - The sampler is located on the roof of the fire station (Main Street) about 15 feet above ground level. It is set back from Main Street about 75 feet in a primarily light commercial/residential zoned area.

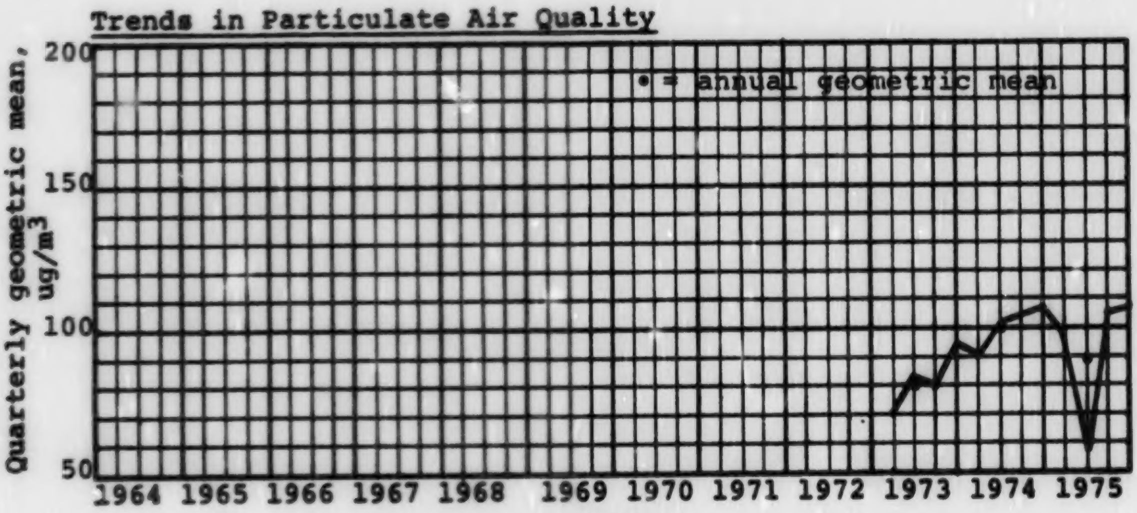
Localized pollution influences - The sides and back of the fire station are bordered by large unpaved alleys.

Physical interferences - The only physical obstruction on the roof is a fire hose drier which should not interfere with the sampler's exposure. There are no taller buildings in the area.

Terrain - The site area is flat and sits in the South Platte River Valley. The mean elevation is approximately 4,670 feet msl.

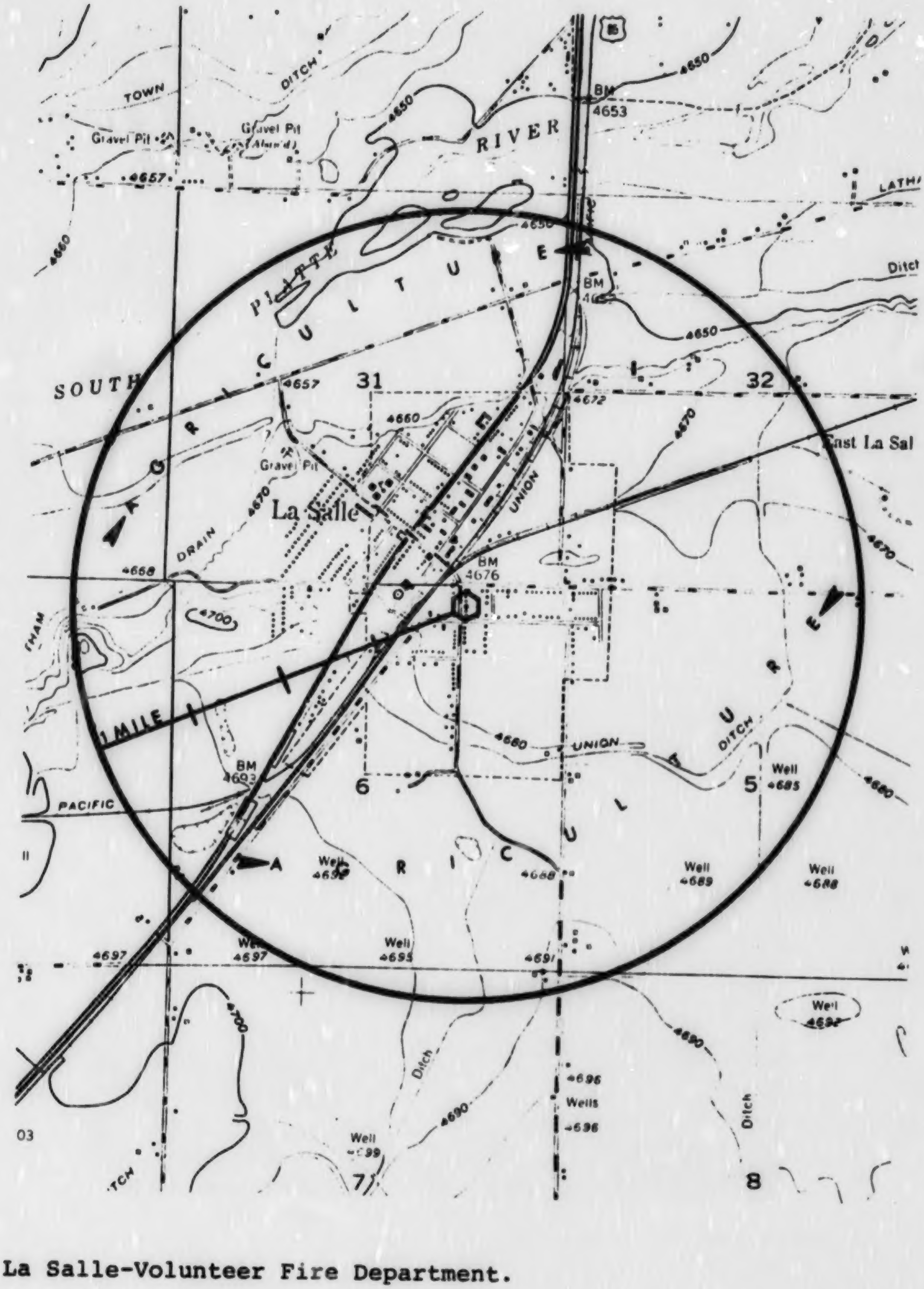
Comments - It is possible that this sampler is presenting a biased indication of air quality due to the close proximity of the unpaved alleys alongside the fire station.

Trends in Particulate Air Quality



La Salle sampler viewed to the east.

La Salle sampler viewed to the west.


TOWN
DITCH
Gravel Pit
Gravel Pit (Aband)
4657
4650
RIVER
BM 4653
LATHAM
PLATTE
SOUTH
AGRICULTURE
Ditch
4650
31
32
4657
4660
4672
4670
Gravel Pit
La Salle
DRAIN
UNION
East La Sal
BM 4676
4668
4700
1 MILE
BM 4693
PACIFIC
4660
UNION
DITCH
6
5
Well 4685
4680
Well 4689
Well 4688
4688
4697
Well 4697
Well 4695
4691
Well 4692
4690
Ditch
4696
Wells 4696
Well 4699
03
7
8

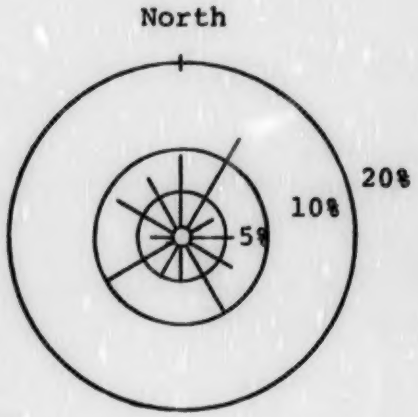
La Salle-Volunteer Fire Department.

Sources in Microinventory Area (1 mile radius)

Population = 1,300

La Salle VMT = 21,200

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
John Ewing			15
Weld Grain			neg
Area sources:			
Fuel combustion	From AQMA emission inventory report, 1.4% of county pop		6
Other mobile			2
Motor vehicle exhaust	21200 VMT/day	0.59 g/VMT	5
Fugitive dust sources:			
Unpaved roads	2.4 mi, 30 ADT	3.5 lb/VMT	46
Unpaved shoulders	2.3 mi	0.62 t/ac/yr	3
Paved roads	0.9% of county VMT (1837 t/yr)		17
Unpaved parking lots	28 ac	1.4 lb/VMT	16
Agriculture	1280 ac	0.25 t/ac/yr	314
Construction	9 ac, 4 mo	0.62 t/ac/mo	22
Cleared areas	29 ac	0.59 t/ac/yr	17
RR right-of-way	20 ac	0.7 t/ac/yr	14
RR yards	10 ac	0.7 t/ac/yr	7
Playgrounds	2 ac	0.62 t/ac/yr	1
Total emissions, ton/yr			485
Emission density, ton/sq mi/yr			154
Percent fugitive dust			94



Greeley - 0.6% calm
- 9.8% variable

Meteorological Data

Average annual
wind speed = 7.5 mph

Annual precipitation -
1974 = 11.90"
1975 = 16.08"
Normal = 12.20"

No. of days
with precipitation = 80

Maximum Recorded Concentrations

1974 = 797 ug/m^3; 1975 = 388 ug/m^3

Summary and Conclusions

The La Salle site has exceeded the primary standards all three years since it was installed. The major source which appears to impact the sampler is agricultural dust, accounting for 65 percent of emissions in the survey area. All fugitive dust sources account for 94 percent. Estimated emission density of 154 ton/sq mi/yr is less than would be anticipated from the 1975 annual mean of 89 ug/m^3.

A possible explanation for the high ambient measurements is the presence of unpaved alleys and parking areas on three sides of the sampler, as shown in the photographs. These localized influences could be responsible for elevating readings at the site above the standard. Because of the high percentage contribution from fugitive dust sources that cannot be controlled by reasonable measures, nonattainment at this site should be attributed to uncontrollable natural sources or to site bias.

3.20 PLATTEVILLE-TOWN HALL
SAROAD Site No. 06-2220-005

Description

General site description - The sampler is located on the roof of Platteville City Hall in the center of town, about 18 feet above ground level. The immediate surrounding land use is residential, agricultural, and light commercial.

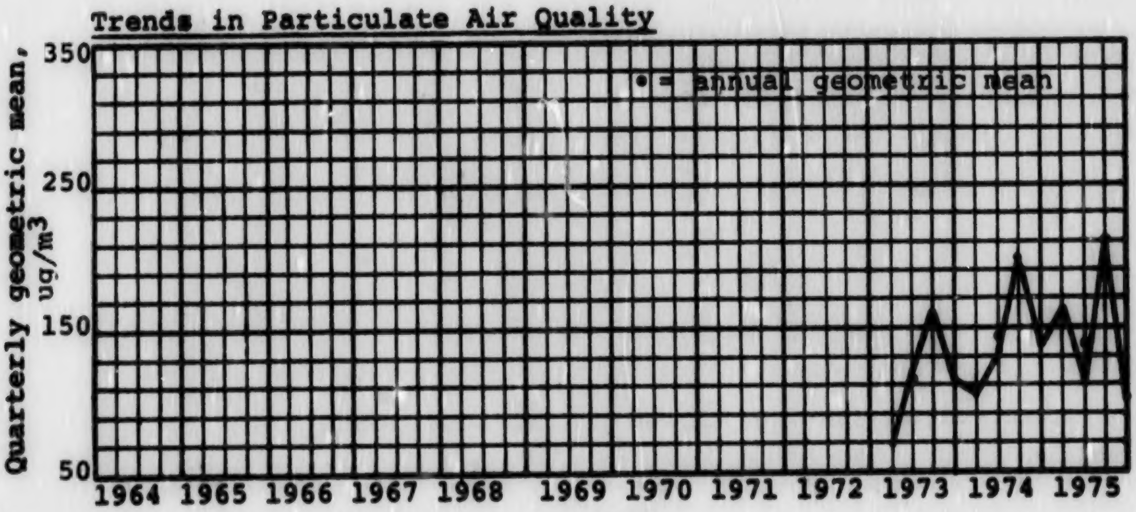
Localized pollution influences - The bordering street (50 feet wide) immediately adjacent to City Hall and the sampler is unpaved. There are unpaved lots surrounding the site. Generally, the whole town is unpaved and dirty.

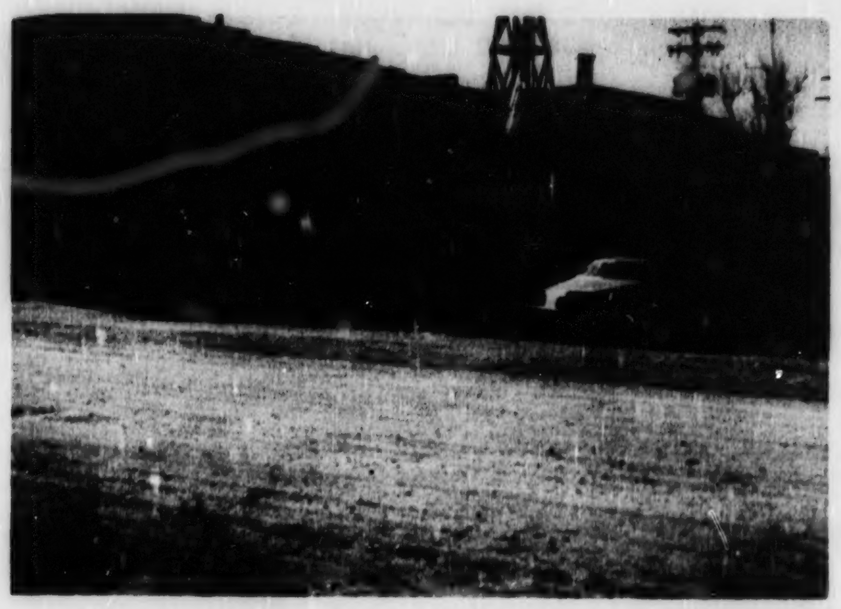
Physical interferences - The adjacent building due east of the sampler is 10 feet higher and an effective obstruction.

Terrain - The terrain immediately surrounding the sampler is flat, while rolling hills and ridges predominate to the east and west sections of the 1 mile radius area.

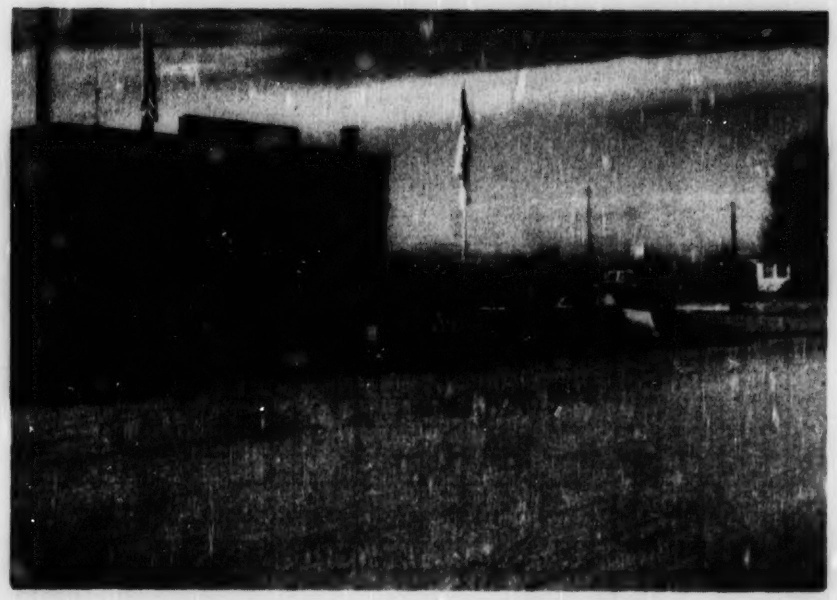
Comments - Due to the overall dustiness of the entire area and the large quantity of unpaved roads and unvegetated areas, this site is probably yielding measurements quite representative of air quality in Platteville.

Trends in Particulate Air Quality

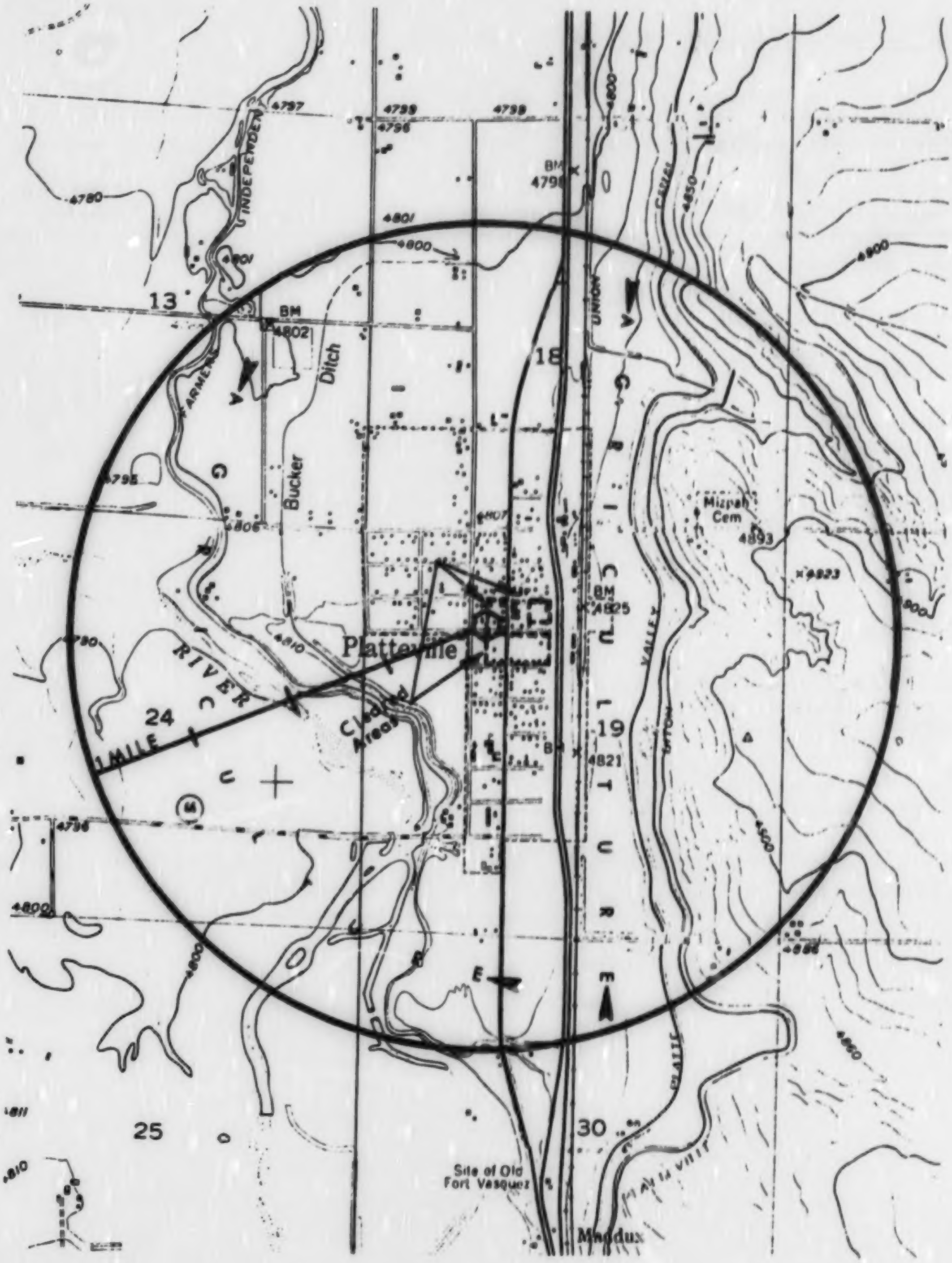




Platteville sampler viewed to the southeast.



Platteville sampler viewed to the southwest.


4797
4799
4796
4799
INDEPENDENT
4780
BM 4798
4801
4800
4801
13
BM 4802
FARMERS
Bucker
Ditch
18
UNION
CANAL
4850
4900
A
G
R
I
C
U
L
T
U
R
E
Mizpeh Cem
4893
4823
4900
4795
4806
4807
BM 4825
Platteville
4790
RIVER
4810
24
1 MILE
Cleared Areas
19
BM 4821
VALLEY
UPTON
4796
4800
4800
E
E
PLATTE
4860
4811
25
30
4810
Site of Old Fort Vasquez
Maddux

Platteville-Town Hall.

Sources in Microinventory Area (1 mile radius)

Platteville

Population = 700
VMT = 18,700

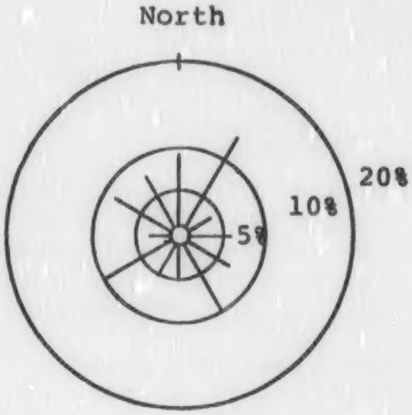
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Platteville Elevator			neg
Area sources:			
Fuel combustion	From AQMA emission		3
Incineration	inventory report,		neg
Other mobile	0.8% of county pop		1
Motor vehicle exhaust	18700 VMT/day	0.59 g/VMT	4
Fugitive dust sources:			
Unpaved roads	7.7 mi, 50 ADT	3.5 lb/VMT	246
Unpaved shoulders	8.0 mi	0.62 t/ac/yr	12
Paved roads	0.8% of county VMT (1837 t/yr)		15
Unpaved parking lots	15 ac	1.4 lb/VMT	9
Agriculture	280 ac	0.25 t/ac/yr	69
Cleared areas	25 ac	0.59 t/ac/yr	15
RR right-of-way	12 ac	0.7 t/ac/yr	8
Playgrounds	3 ac	0.62 t/ac/yr	2
Total emissions, ton/yr			384
Emission density, ton/sq mi/yr			122
Percent fugitive dust			98

Meteorological Data

Average annual
wind speed = 7.5 mph

Annual precipitation -
1974 = 11.90"
1975 = 16.08"
Normal = 12.20"

No. of days
with precipitation = 80



Greeley - 0.6% calm
- 9.8% variable

Maximum Recorded Concentrations

1974 = 659 ug/m^3; 1975 = 481 ug/m^3

Summary and Conclusions

The Platteville site has exceeded the primary standards all three years since it was installed. Unlike most of the Colorado samplers, this site records its highest seasonal readings during the third (summer) quarter. The major source categories influencing the sampler were shown to be unpaved roads (64%) and agriculture (18%). The emission density of 122 ton/sq mi/yr does not appear to be high enough to justify average ambient concentrations in the 90's. However, a closer review of the location of the sources--almost all streets in the town are unpaved--indicates that most of the emissions are concentrated within a quarter mile of the site and therefore have a disproportionately large impact on the sampler. The higher summer readings also tend to substantiate the large influence of dust from unpaved roads at this site.

Although the readings are certainly inflated as a result of the nearby unpaved roads (see photographs), the same concentrations probably exist in all parts of Platteville. Control technology is available for reducing emissions from unpaved roads, e.g., paving, but it is questionable whether this is a reasonable control measure for this town. Since the State APCD already has a policy of encouraging road paving on the basis of its air quality benefit and has an existing program to implement this policy, an SIP revision does not seem to be needed.

3.21 COLORADO SPRINGS-HEALTH DEPARTMENT
SAROAD Site No. 06-0380-004

Description

General site description - The sampler is located on the roof of the City-County Health Department building about ten feet above ground level. It is set back 100 feet from South Tejon Street. The surrounding area is combined light commercial and residential land use.

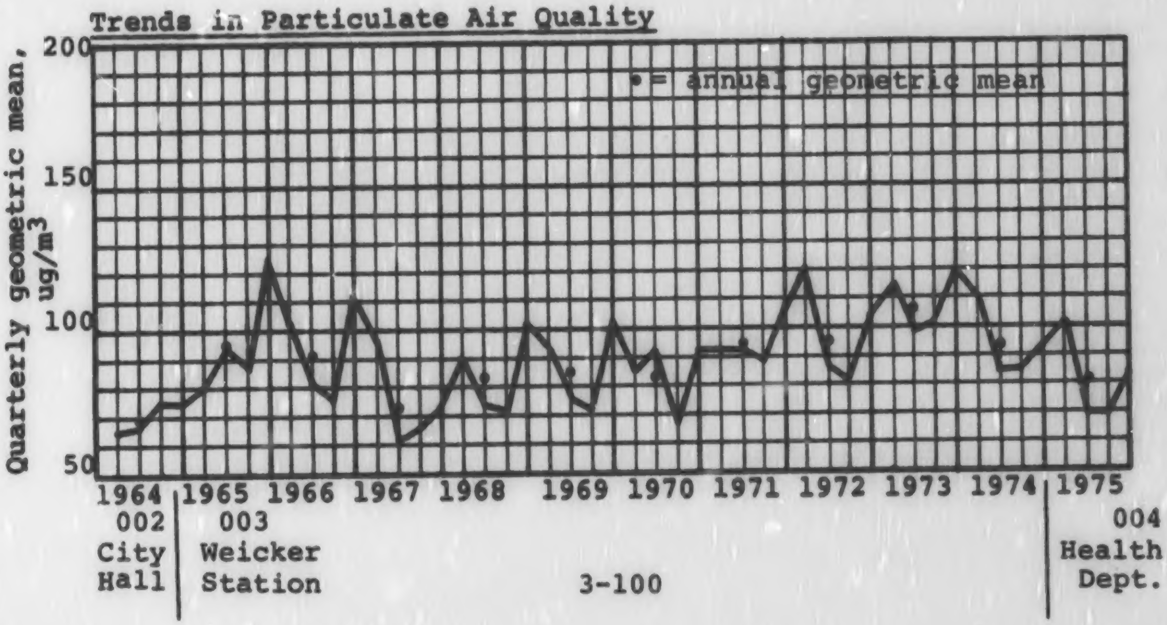
Localized pollution influences - The Health Department building is surrounded on three sides by single story houses. There is a paved parking lot at the rear of the building. The roof has two small exhaust vents and two air conditioner compressors, but none of these appear to affect the sampler's readings.

Physical interferences - No obstructions were noted in the vicinity of the sampler. There were no taller buildings in the immediate area.

Terrain - The surrounding area is generally flat, with rolling hills near the edge of the 1 mile radius to the west. The foothills of the Rocky Mountains start about three miles west of the site.

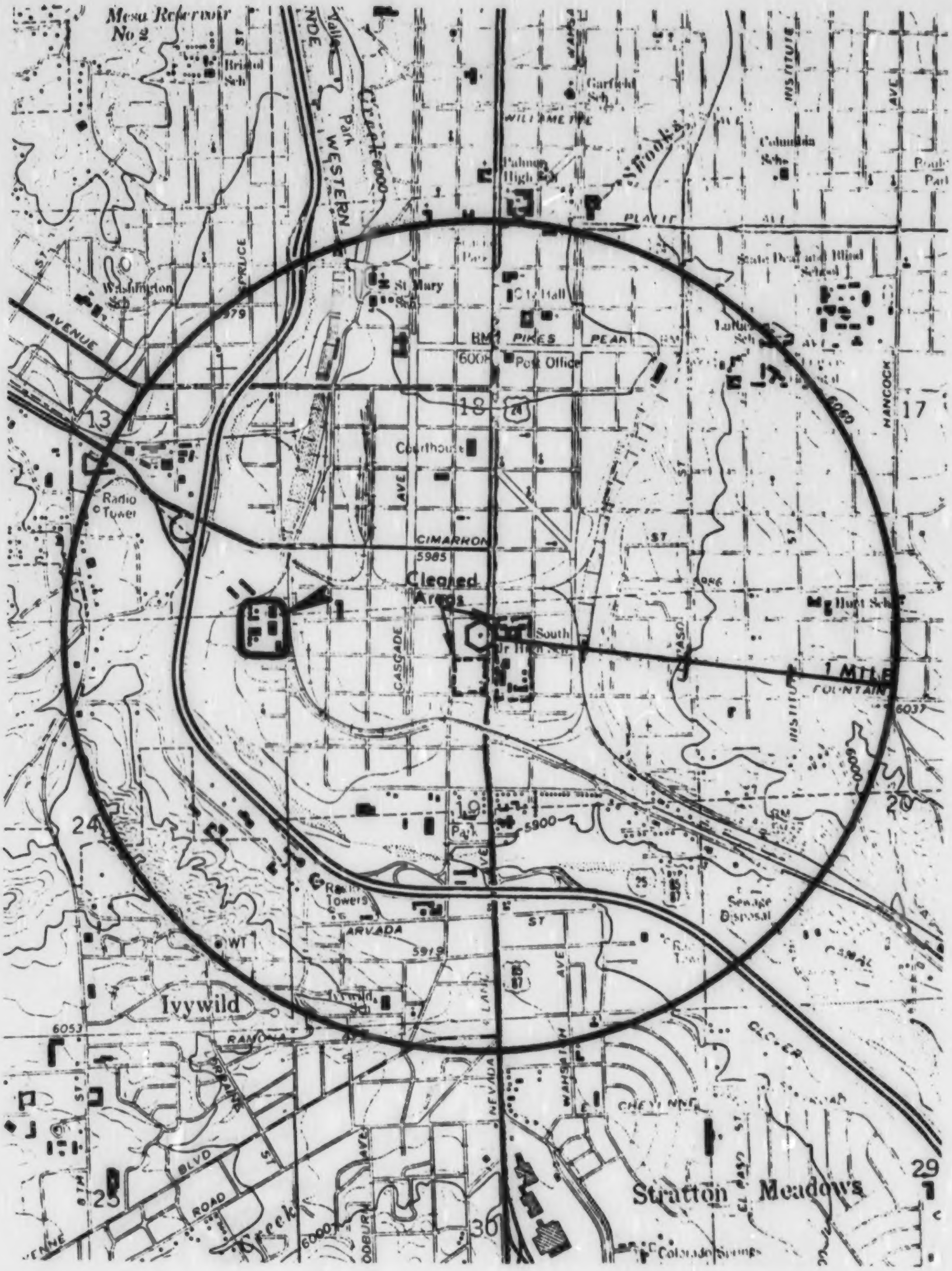
Comments - This site has a good general urban exposure. The streets in the area appear to be swept routinely and were clean at the time of the survey. The sampler was moved from 205 West Rio Grande (Weicker station) in January 1975. The former site was three blocks west of the present one.

Trends in Particulate Air Quality



Colorado Springs sampler viewed to the west-northwest.

Colorado Springs sampler viewed to the southwest.


Mesa Reservoir No 2
Bristol Sch
Garfield Sch
WILLAMETTE
Columbia Sch
Palmer High Sch
PLATTE
Washington Sch
AVENUE
St Mary
State Deaf and Blind School
City Hall
PIKES PEAK
Post Office
HANCOCK
13
18
17
Courthouse
Radio Tower
CIMARRON
5985
Cleared Areas
South Jr High Sch
CASCADE
1 MILE
FOUNTAIN
6037
Hunt Sch
INSTITUTE
19
20
24
Radio Towers
ARVADA
5919
Sewage Disposal
CANAL
Ivywild
Ivywild Sch
RAMONA
6053
NEVADA
WAHSATCH
CHEYENNE
BLVD
ROAD
Creek
25
30
29
Stratton Meadows
Colorado Springs

Colorado Springs-Health Department.

Sources in Microinventory Area (1 mile radius)

Colorado Springs

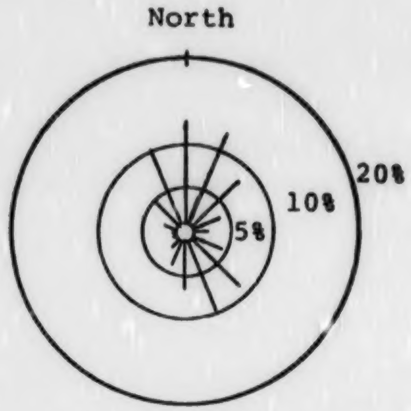
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 Drake Power Plant			55
Denver Equipment			1
Simpson Company			neg
Colorado Concrete			neg
Transit Mix			4
School for Deaf			7
Ready Mix			10
Area sources:			
Fuel combustion	From AQMA analysis, 35% of emissions in grids 31,32,37,and 38		135
Other mobile			4
Motor vehicle exhaust			58
Fugitive dust sources:			
Unpaved roads	5.3 mi	3.5 lb/VMT	39
Unpaved shoulders	3.8 mi	0.617 t/ac/yr	6
Paved roads	From AQMA analysis grids		347
Unpaved parking lots	80 ac	1.4 lb/VMT	46
Construction	7 ac, 4 mos	0.8 t/ac/mo	22
Cleared areas	100 ac	0.59 t/ac/yr	59
RR right-of-way	29 ac	0.7 t/ac/yr	20
RR yards	57 ac	0.7 t/ac/yr	40
Aggregate storage	12 ac	13.14 t/ac/yr	158
Playgrounds	5 ac	0.62 t/ac/yr	3
Total emissions, ton/yr			1014
Emission density, ton/sq mi/yr			323
Percent fugitive dust			73

Meteorological Data

Average annual
wind speed = 10.0 mph

Annual precipitation
1974 = 9.50"
1975 = 11.77"
Normal = 15.73"

No. of days
with precipitation = 90



Colorado Springs Airport - 1% calm

Maximum Recorded Concentrations

1974 = 804 ug/m^3; 1975 = 350 ug/m^3

Summary and Conclusions

In its previous location (Weicker station), this site in Colorado Springs recorded annual means in the 80's and 90's for 10 years. At the end of 1974, the site was moved to the Health Department building where it measured 81 ug/m^3 for 1975. Seasonal concentrations are generally highest in the first and fourth quarters, but the seasonal variation is not as pronounced as in the Denver area. Possibly this is because less street sanding is needed for snow control in Colorado Springs.

The sampler appears to be well located in its new site and free from any localized influences. The estimated emission density of 323 ton/sq mi/yr certainly supports the recorded concentrations above the standard. About 40 percent of the emissions in this central residential/commercial area are traffic related, with most of the remainder being various fugitive dust sources. Point sources account for less than eight percent. One potential control measure for attainment would be improved street cleaning, while another would be increased enforcement of existing fugitive dust regulations. In the former case, an SIP revision would be needed; in the latter case, it would not.

3.22 PUEBLO-FIRE STATION

SAROAD Site No. 06-1820-003

Description

General site description - The sampler is located on the roof of the fire station (Mesa and Evans) about 20 feet above ground level in the commercially developed central business district of Pueblo. It is in an area of heavily traveled streets.

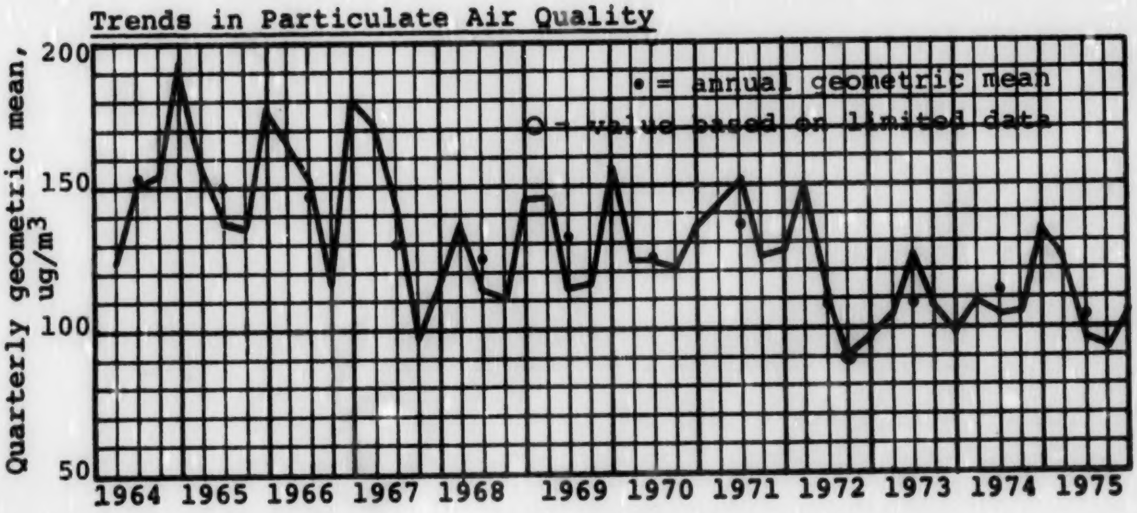
Localized pollution influences - There are no local adverse influences which would affect the sampler's readings.

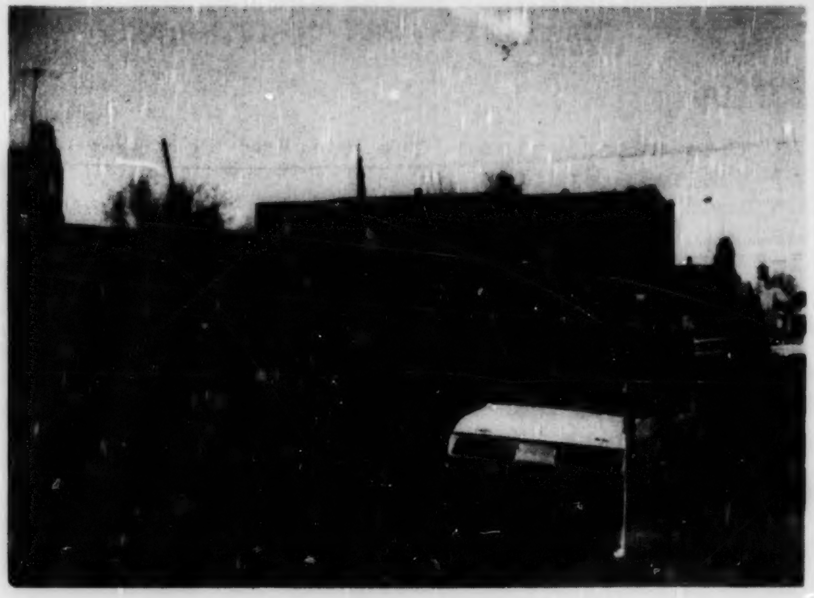
Physical interferences - The sampler is sheltered on one side by a high wall 50 feet to the southeast.

Terrain - All surrounding terrain is flat.

Comments - The sampler is probably representative of air quality in this central business district area.

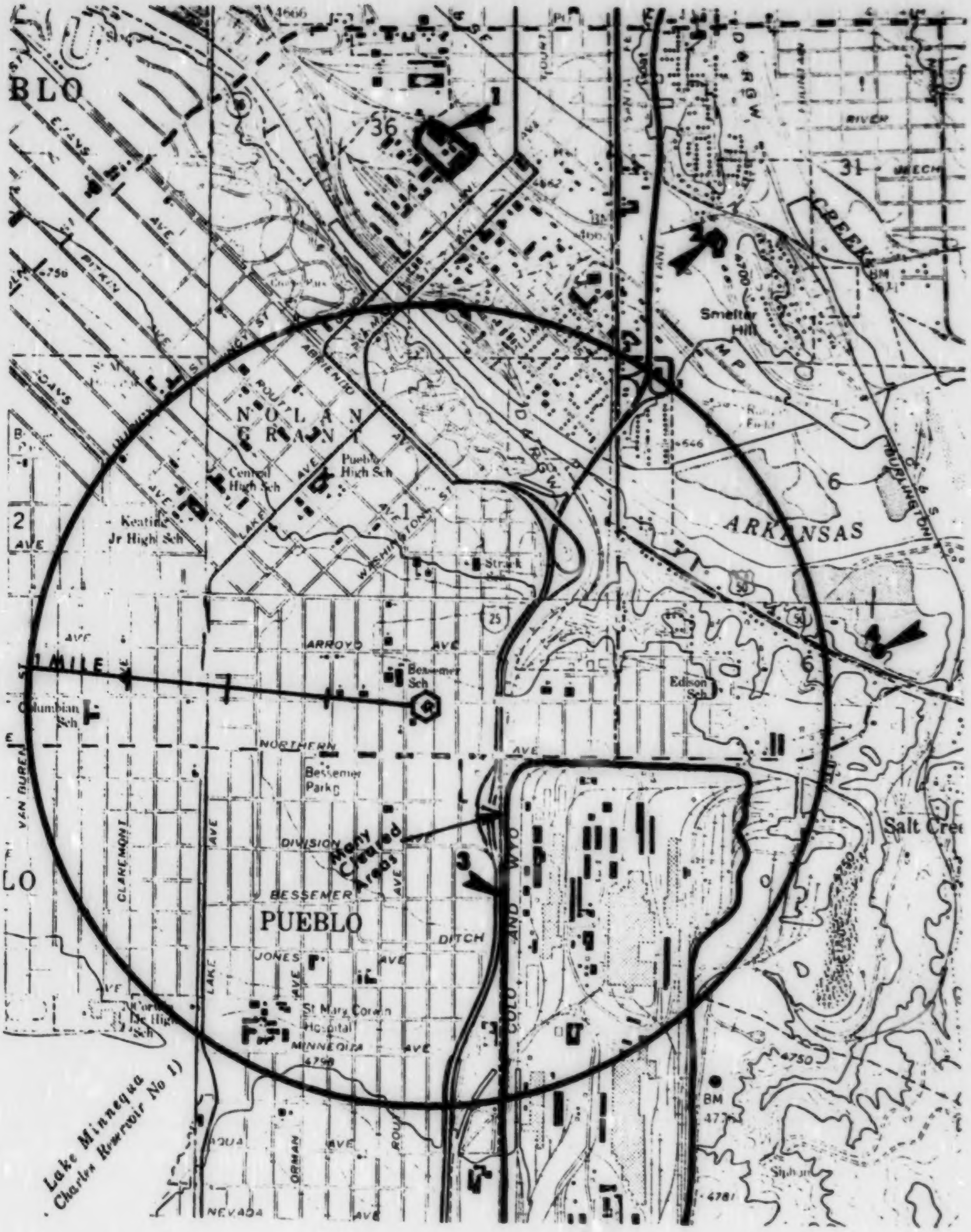
Trends in Particulate Air Quality





Pueblo-Fire Station sampler viewed to the northwest.

Pueblo-Fire Station sampler viewed to the southwest.

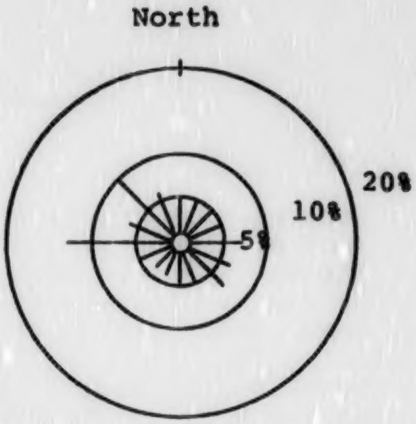

BLO
36
1
31
4666
4662
D&RGW
RIVER
CREEK
Smelter Hill
NOLAN GRANT
Pueblo High Sch
Central High Sch
Keating Jr High Sch
2
ARKANSAS
Strack Sch
25
50
ARROYO AVE
Bessemer Sch
1 MILE
Columbian Sch
NORTHERN AVE
Edison Sch
6
Bessemer Park
DIVISION AVE
Many Cleared Areas
3
BESSEMER
PUEBLO
DITCH
JONES AVE
St Mary Corwin Hospital
MINNEQUA AVE
4790
LO
VAN BUREN
CLAREMONT
LAKE AVE
COLO. AND WYO.
Salt Cre
4750
BM 4773
4781
Siphon
NEVADA AVE
ORMAN AVE
Lake Minnequa
Charles Reservoir No 1

Pueblo-Fire Station.

Sources in Microinventory Area (1 mile radius)

Pueblo-Fire Station

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 Southern Colorado Power Plant	Outside mile radius		23
2 Pueblo Rock Wool	Outside mile radius		129
Alpha Beta Packing			2
3 CF&I Steel			1500 (est)
Midwest Steel & Iron			neg
Linde Company (Gases)			neg
Pueblo Metals			8
4 Fountain Sand & Gravel			81
Colorado Iron & Metal	Outside mile radius		unknown
Area sources:			
Fuel combustion	From AQMA analysis, 20% of emissions in 37, 60% in grid 38, and 30% in grid 30		110
Other mobile			8
Motor vehicle exhaust			35
Fugitive dust sources:			
Unpaved roads	0.1 mi, 20 ADT	3.5 lb/VMT	1
Unpaved shoulders	0.9 mi	0.52 t/ac/yr	1
Paved roads	From AQMA analysis		74
Unpaved parking lots	20 ac	1.4 lb/VMT	12
Cleared areas	220 ac	0.49 t/ac/yr	108
RR right-of-way	21 ac	0.59 t/ac/yr	12
RR yards	55 ac	0.59 t/ac/yr	33
Playgrounds	2 ac	0.52 t/ac/yr	1
Total emissions, ton/yr			1986
Emission density, ton/sq mi/yr			632
Percent fugitive dust			12



Pueblo - 2% calm

Meteorological Data

Average annual
  wind speed = 7.7 mph

Annual precipitation
    1974 = 9.68"
    1975 = 9.88"
  Normal = 11.91"

No. of days
  with precipitation = 65

Maximum Recorded Concentrations

1974 = 454 ug/m^3; 1975 = 317 ug/m^3

Summary and Conclusions

This Pueblo site has shown a steady decrease in annual mean concentrations from 153 ug/m^3 in 1964 to 104 ug/m^3 in 1975. Seasonal variations do not show a set pattern. Most of the emissions (80%) in the microinventory survey area are from a few major point sources. Fugitive dust sources (outside the industrial point sources' property) account for only 12 percent of the emissions. The emission density of 632 ton/sq mi/yr is quite consistent with the high ambient measurements. There do not appear to be any localized sources unduly influencing the readings at the site.

It appears that emission reductions by the largest point source, CF&I Steel, would be necessary in order for this site to attain the primary standards. However, it cannot be determined at this time whether an SIP revision is necessary in order to obtain these emission reductions, as the compliance status of CF&I Steel is being contested in a court case between the company and the state. Until a decision is reached in this case, no SIP revision for this area should be requested.

3.23 PUEBLO-HEALTH DEPARTMENT
SAROAD Site No. 06-1820-001

Description

General site description - The sampler is located on the roof of the Health Department building (151 Central Main Street) about 25 feet above ground level. It is in the central business district or downtown, but very near a heavy industrial district.

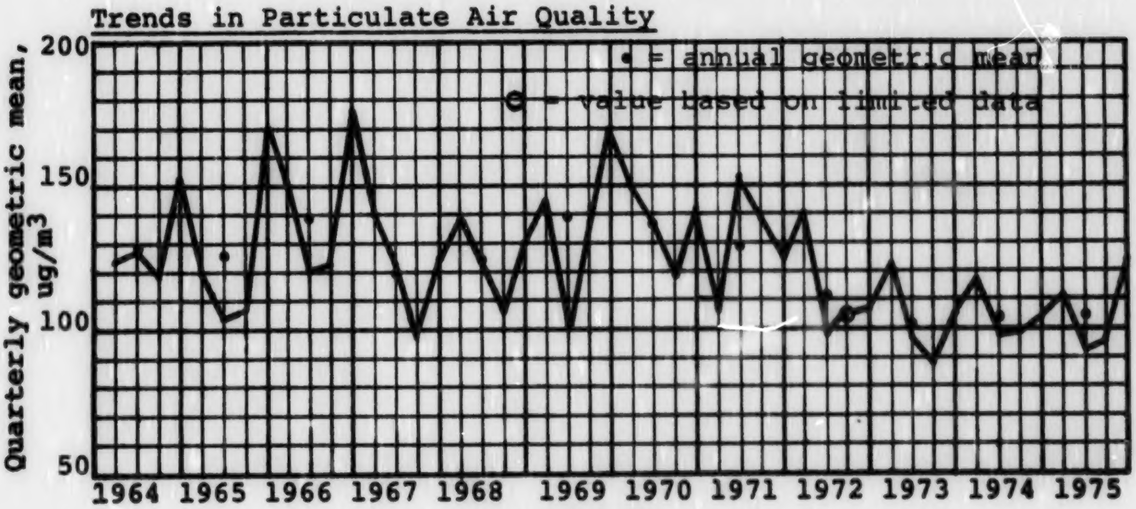
Localized pollution influences - There are three roof vents on the building in proximity to the sampler and an unidentified industrial facility west of the site. The area has many heavily traveled streets.

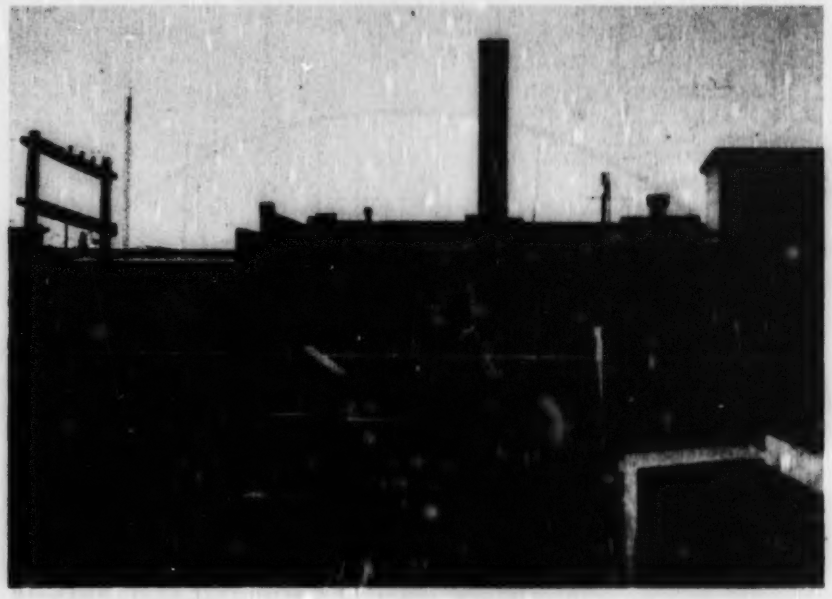
Physical interferences - The sampler is severely sheltered on all four sides by roof retaining walls and parapets and a stairway tower.

Terrain - The immediate and surrounding area is generally flat. Many buildings are in the vicinity but none are higher than the sampler.

Comments - The area generally has a high incidence of point source pollution, especially steel mill operations and sand and gravel operations. Fugitive dust sources predominate throughout. With the exception of the obstructions caused by the roof parapet, the sampler is probably obtaining a representative indication of air quality in this area.

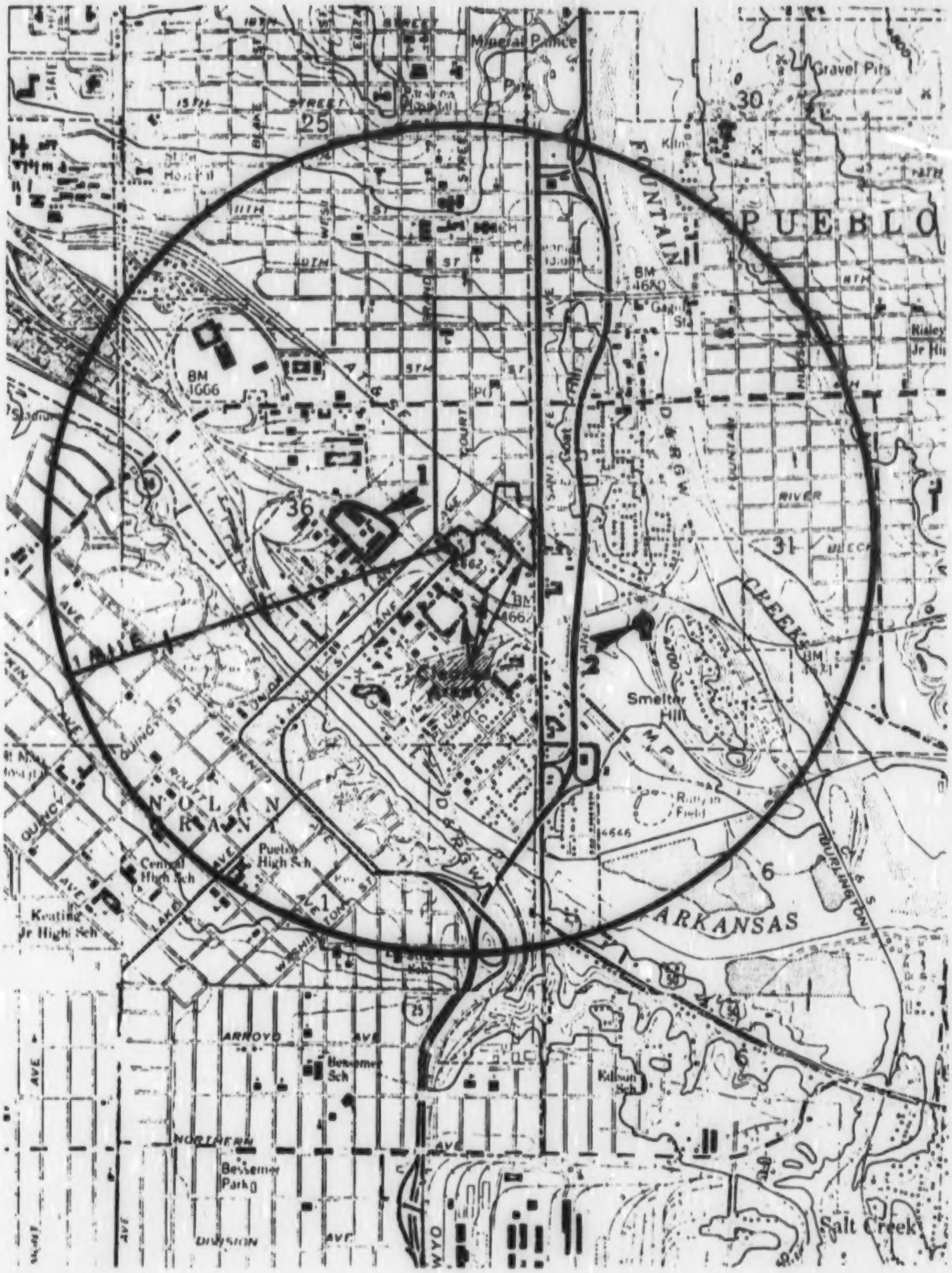
Trends in Particulate Air Quality





Pueblo-Health Department sampler viewed to the northwest.

Pueblo-Health Department sampler viewed to the southeast.


Mineral Palace
Park
Gravel Pits
30
25
FOUNTAIN
PUEBLO
BM 4680
Risley Jr Hi
BM 1666
AT & SF
D & RGW
36
31
CREEK
1 MILE
BM 4662
Smelter Hill
M.P.
NOLAN GRANT
Central High Sch
Pueblo High Sch
Keating Jr High Sch
ARKANSAS
C & S
BURLINGTON
6
ARROYO AVE
Bessemer Sch
NORTHERN AVE
Bessemer Park
DIVISION AVE
Salt Creek

Pueblo-Health Department.

Sources in Microinventory Area (1 mile radius)

Pueblo-Health Department

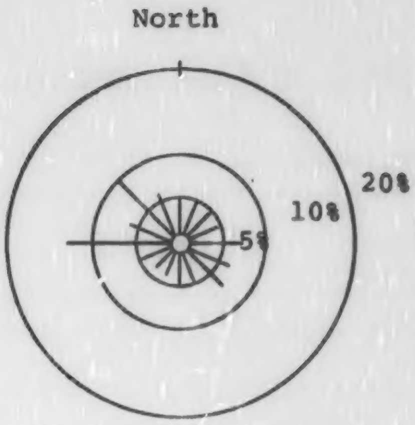
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 Southern Colorado Power Plant			23
2 Pueblo Rock Wool			129
Sweeney Feed Mill			2
Alpha Beta Packing			2
CF&I Steel	Outside mile radius		1500 (est)
Fountain Sand & Gravel	Outside mile radius		81
Colorado Iron & Metal	Outside mile radius		unknown
Area sources:			
Fuel combustion	From AQMA analysis, 80% of emissions in 30, 10% in grid 29, and 20% in grid 24		148
Other mobile			10
Motor vehicle exhaust			62
Fugitive dust sources:			
Unpaved roads	0.9 mi, 40 ADT	3.5 lb/VMT	23
Paved roads	From AQMA analysis		132
Unpaved parking lots	28 ac	1.4 lb/VMT	16
Cleared areas	48 ac	0.49 t/ac/yr	24
RR right-of-way	34 ac	0.59 t/ac/yr	20
RR yards	120 ac	0.59 t/ac/yr	71
Aggregate storage	3 ac	13.14 t/ac/yr	39
Playgrounds	3 ac	0.52 t/ac/yr	2
Total emissions, ton/yr			703
Emission density, ton/sq mi/yr			224
Percent fugitive dust			47

Meteorological Data

Average annual
  wind speed = 7.7 mph

Annual precipitation
    1974 = 9.68"
    1975 = 9.88"
  Normal = 11.91"

No. of days
  with precipitation = 65



Pueblo - 2% calm

Maximum Recorded Concentrations

1974 = 280 ug/m^3; 1975 = 261 ug/m^3

Summary and Conclusions

The Health Department site has experienced an irregular decrease in annual mean concentrations over the past 12 years, but has always reported annual averages above 100 ug/m^3. Seasonal variations have tended to become smaller in recent years. The microinventory survey showed that a wide variety of sources and source categories contribute to the high measured concentrations: point sources within the mile radius (22%), residential/commercial fuel combustion (21%), reentrained dust from paved streets (19%), other fugitive dust sources (28%), and the unquantified impact from more distant major point sources. The emission density of 224 ton/sq mi/yr is relatively low for the measured ambient values, possibly reflecting a significant contribution from these major point sources.

No nearby sources which might bias the sampler's readings were identified. Roof parapets may block the sampler's exposure somewhat, thus reducing the recorded measurements from actual levels.

Attainment at this site will probably require emission reductions from several types of sources, possibly including CF&I Steel (which may also have to reduce emissions for the other Pueblo site to reach the standards). Fugitive dust sources with potential for emission reductions include paved streets, unpaved roads and parking lots, railroad yards, and cleared areas. The compliance status of Pueblo Rock Wool was not determined.

3.24 TRINIDAD-RECTORY
SAROAD Site No. 06-2160-002

Description

General site description - The sampler is located on the roof of a garage to the rear of a church rectory (235 Convent Street) about 8 feet above ground level. It is about 50 feet off of Convent Street and borders on a school parking lot in a residential area.

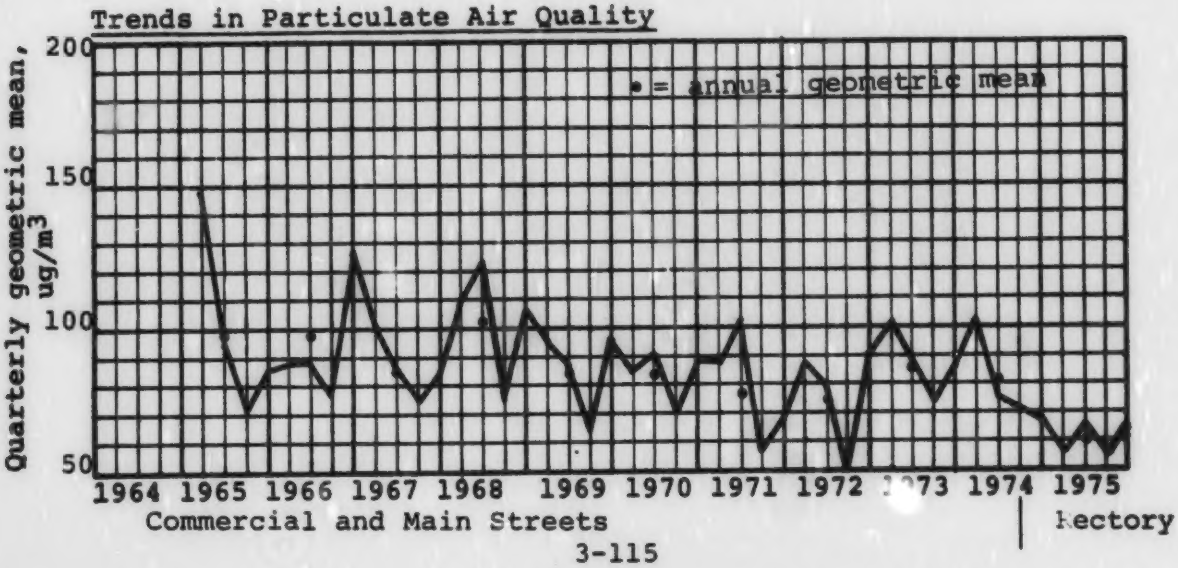
Localized pollution influences - There are no obvious localized pollution influences in the immediate vicinity of the sampler, other than the paved parking lot immediately behind the site.

Physical interferences - The sampler is bordered on two sides by a wall (4 feet high and 6-8 inches lower than the sampler head) approximately 6 feet away. The school building to the rear of the church rectory is higher than the sampler's elevation.

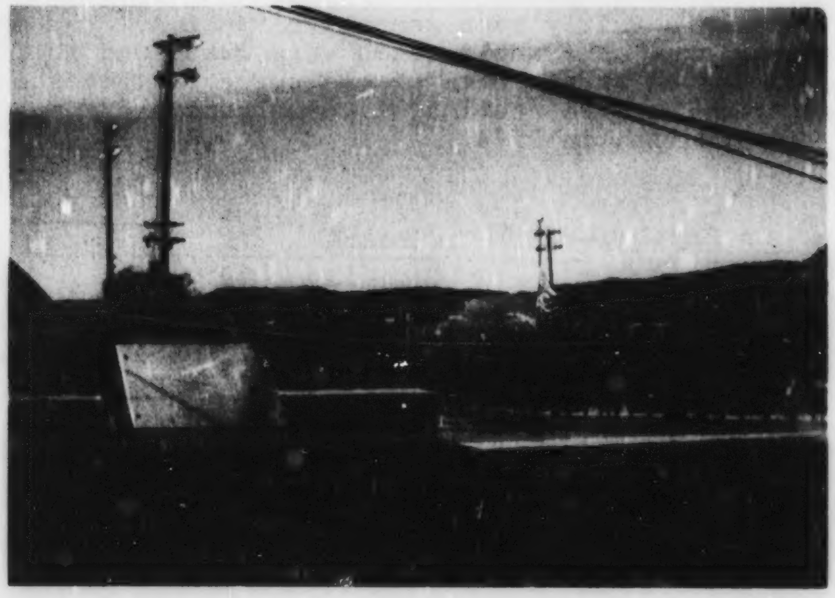
Terrain - The area is rolling with steep ridges to the northwest and southeast and a river valley extending through its center from southwest to northeast. The elevation of the sampler is about 6,000 feet msl.

Comments - The site probably depicts the air quality in Trinidad in a fairly representative fashion. The micro-inventory area as a whole seems very dusty and the streets were uncleaned at the time of the survey. This sampler was moved from the fire station at Commercial and Main to its present location in 1974.

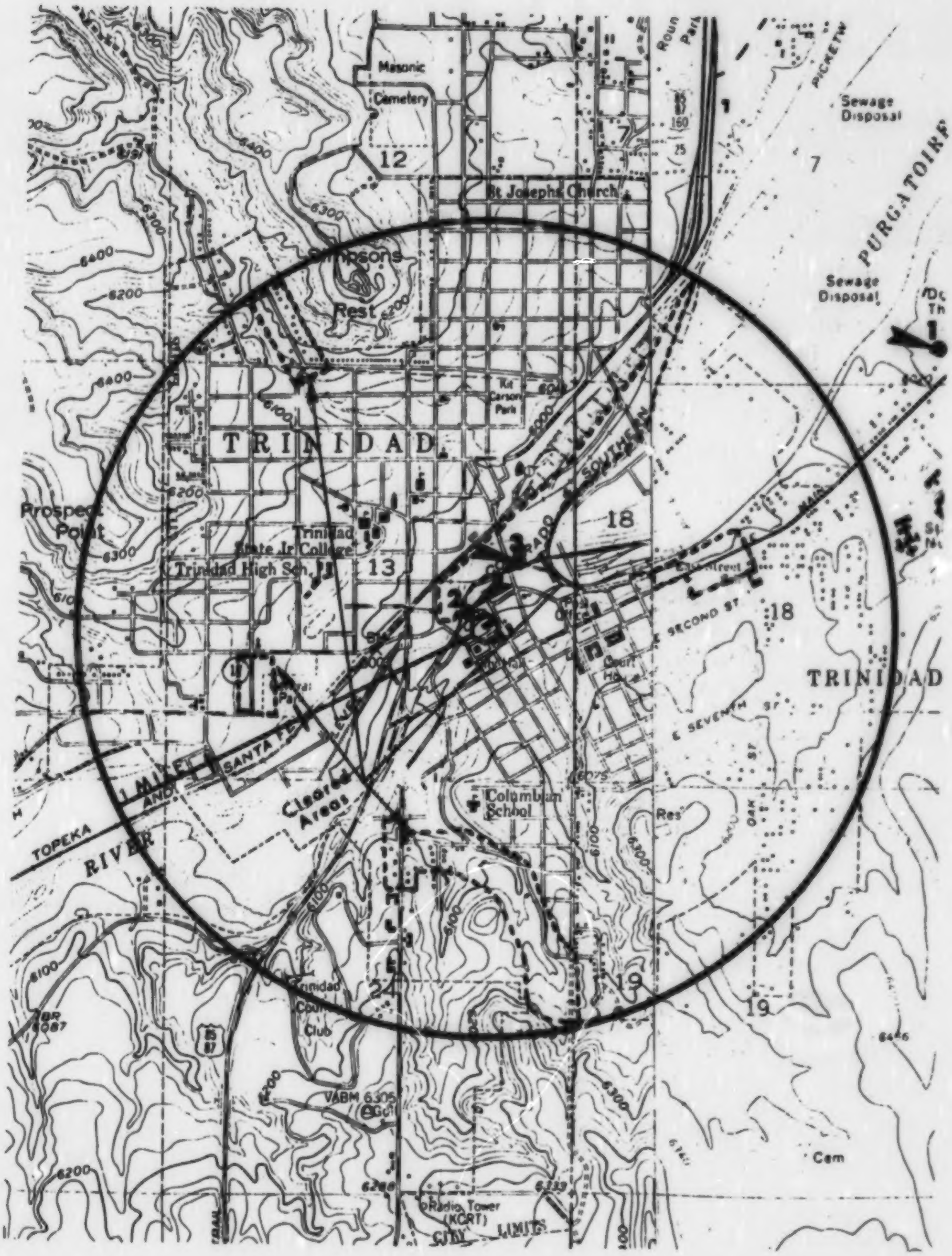
Trends in Particulate Air Quality



Trinidad sampler viewed to the south-southeast.



Trinidad sampler viewed to the northwest.


Masonic Cemetery
12
St Josephs Church
Simpsons Rest
Sewage Disposal
Sewage Disposal
PURGATOIRE
7
TRINIDAD
Kit Carson Park
Prospect Point
Trinidad State Jr College
Trinidad High Sch
13
18
18
SECOND ST
E SEVENTH ST
Court House
TRINIDAD
SANTA FE
TOPEKA
AND
RIVER
1 MILE
Cleared Areas
Columbian School
Res
24
19
19
Trinidad Country Club
VABM 6305
Radio Tower (KCRT)
CITY LIMITS
Cem
6400
6300
6200
6100

Trinidad-Rectory.

Sources in Microinventory Area (1 mile radius)

Trinidad

Population = 8,000
VMT = 33,200

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 Municipal Power Plant	Outside mile radius		6
2 Rede Mix Concrete			2 (est)
3 Marty Feeds			2 (est)
Area sources:			
Fuel combustion	From TRW inventory report, 51% of county pop		40
Other mobile			5
Incineration			17
Motor vehicle exhaust	33200 VMT/day	0.59 g/VMT	8
Fugitive dust sources:			
Unpaved roads	7.3 mi, 30 ADT	3.6 lb/VMT	145
Unpaved shoulders	9.9 mi	0.86 t/ac/yr	21
Paved roads	33200 VMT/day	3.5 g/VMT	47
Unpaved parking lots	40 ac	1.4 lb/VMT	24
Cleared areas	132 ac	0.82 t/ac/yr	108
RR right-of-way	29 ac	0.99 t/ac/yr	29
RR yards	63 ac	0.99 t/ac/yr	62
Playgrounds	5 ac	0.86 t/ac/yr	4
Total emissions, ton/yr			514
Emission density, ton/sq mi/yr			164
Percent fugitive dust			86

Meteorological Data

No local data available.

Maximum Recorded Concentrations

1974 = 197 ug/m^3; 1975 = 147 ug/m^3

Summary and Conclusions

The Trinidad site consistently measured annual mean concentrations above the primary standard from 1965 through 1974. However, in late 1974 the site was moved a few blocks from its historic location to a new site where the 1975 mean was 60 ug/m^3. The estimated emission density of 164 ton/sq mi/yr agrees well with the relatively low concentrations now being measured and indicates that the previous site may have had some localized sources inflating the readings. The new site has no obvious localized sources or obstructions biasing its measurements.

Most of the emissions within the mile radius were determined to be from difficult-to-control fugitive dust sources. Unpaved roads (28%), cleared areas (21%), railroad yards and right-of-ways (18%), and paved roads (9%) were the major sources.

Although Trinidad was observed to be quite dusty, the particulate concentrations and inventory results both indicate that the area is not exceeding the primary standards. If another site only a few blocks away recorded concentrations above the standards, it is assumed that some source with a very localized effect was causing this violation.

3.25 WALSENBURG-HUERFANO COUNTY SHOP BUILDING
SAROAD Site No. 06-2180-002

Description

General site description - The sampler is located on the roof of the Huerfano County Shop Building (128 West Fifth) about 20 feet above ground level. The location is in the central business district of town and is right off of Fifth Street.

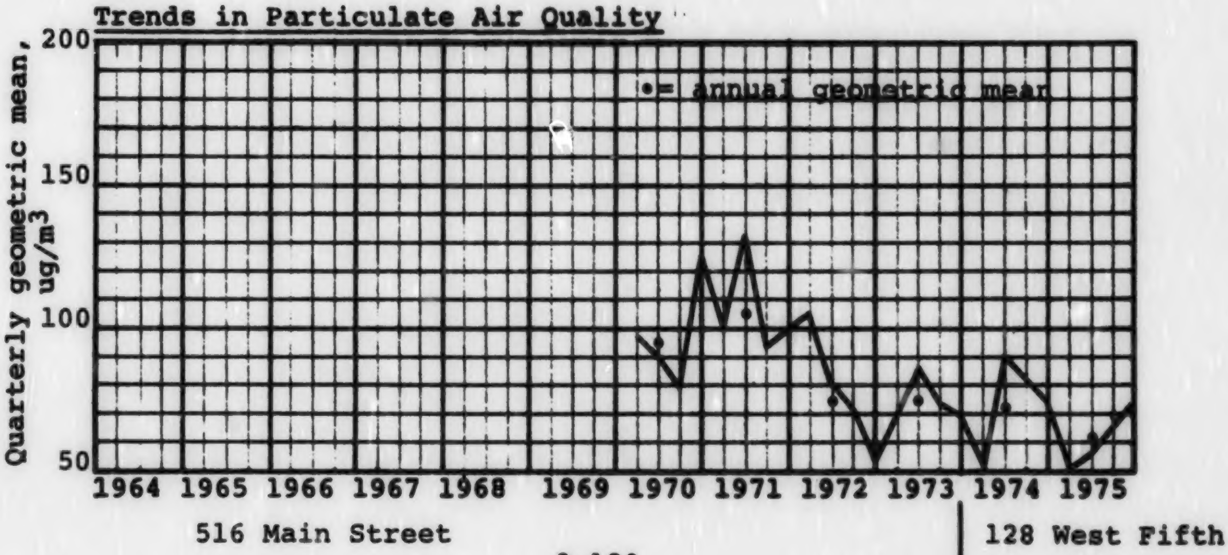
Localized pollution influences - The Walsenburg Creamery (not in operation at the writing of this report) has a stack 200 feet to the northwest and the site building is surrounded on three sides by unpaved parking lots.

Physical interferences - There are no obstructions or taller buildings near the sampler which may affect readings.

Terrain - The terrain in the immediate vicinity of and within a 1/2 mile radius of the sampler is flat, while rolling hills and ridges predominate in the north and south portions of the survey area.

Comments - The town is universally dusty. All the streets are uncleaned and the town is surrounded by open, dry land. The site was moved one block southwest to its present location in 1974 from 516 Main Street. The particulate air quality measured is probably representative of the arid southern part of Colorado.

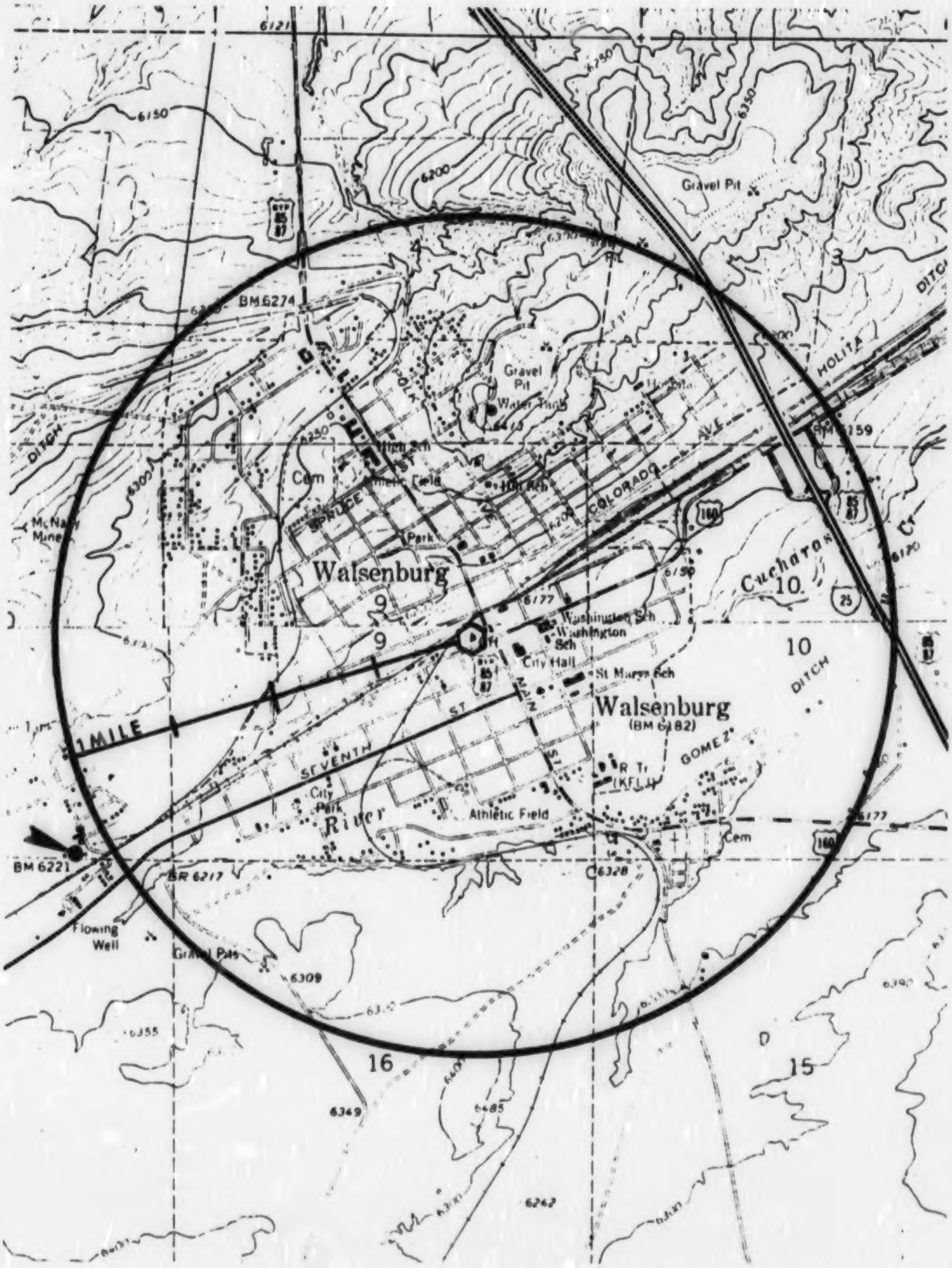
Trends in Particulate Air Quality



Walsenburg sampler viewed to the northeast.

HUERFANO COUNTY

Walsenburg sampler viewed to the northwest.


Walsenburg
Walsenburg
(BM 6182)
Washington Sch
City Hall
St Marys Sch
Athletic Field
City Park
River
Cucharas
Gravel Pit
Water Tank
High Sch
Cem
Park
SPRUCE ST
COLORADO AVE
SEVENTH ST
MAIN ST
GOMEZ
1 MILE
BM 6274
BM 6221
BM 6159
BR 6217
Flowing Well
Gravel Pits
McNally Mine
DITCH
9
10
16
15
3
4
6150
6200
6250
6309
6355
6349
6485
6262
6328

Walsenburg-Huerfano County Shop Building.

Sources in Microinventory Area (1 mile radius)

Population = 4,200
Walsenburg
VMT = 18,500

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Walsenburg Mill			neg
1 Walsenburg Power Plant			225
Sig Sporleder Feeds			neg
Area sources:			
Fuel combustion	From TRW inventory report, 66% of county pop		51
Incineration			8
Other mobile			9
Motor vehicle exhaust	18500 VMT/day	0.59 g/VMT	4
Fugitive dust sources:			
Unpaved roads	13.3 mi, 40 ADT	3.6 lb/VMT	353
Unpaved shoulders	2.7 mi	0.56 t/ac/yr	4
Paved roads	18500 VMT/day	3.5 g/VMT	26
Unpaved parking lots	32 ac	1.4 lb/VMT	19
Cleared areas	25 ac	0.54 t/ac/yr	13
RR right-of-way	25 ac	0.64 t/ac/yr	16
RR yards	50 ac	0.64 t/ac/yr	32
Playgrounds	3 ac	0.56 t/ac/yr	2
Total emissions, ton/yr			762
Emission density, ton/sq mi/yr			243
Percent fugitive dust			61

Meteorological Data

No local data available.

Maximum Recorded Concentrations

1974 = 181 ug/m^3; 1975 = 241 ug/m^3

Summary and Conclusions

The Walsenburg site was started in 1970 and exceeded the primary standards its first two years of operation. For the past four years, the readings have been at or below the standards, with a reduction in the annual mean each year. In 1974, the site was moved one block to its present location.

The two sources with greatest emissions in the survey area are unpaved roads (46%) and the Walsenburg power plant (29%). Although the estimated emission density of 243 ton/sq mi/yr is somewhat higher than would be expected for an annual mean of 61 ug/m^3, much of this apparent emission density is contributed by the power plant located at the edge of the survey area (one mile from the sampler). The emissions from its tall stack at this distance obviously have a much lower effect on ambient concentrations at the sampler than indicated by its portion of the emission density.

The site has unpaved parking lots on three sides, as partially shown in the photographs. These localized sources probably increase measured concentrations, but it appears that the readings will still be well under the primary standards. This site should be classified as having attained the primary standards.

3.26 STEAMBOAT SPRINGS-MUNICIPAL BUILDING
SAROAD Site No. 06-1920-002

Description

General site description - The sampler is located on the roof of the Municipal Building (Sixth and Lincoln) about 15 feet above ground level and set back from Sixth Street about 40 feet. It is in an area of residential and light commercial land use.

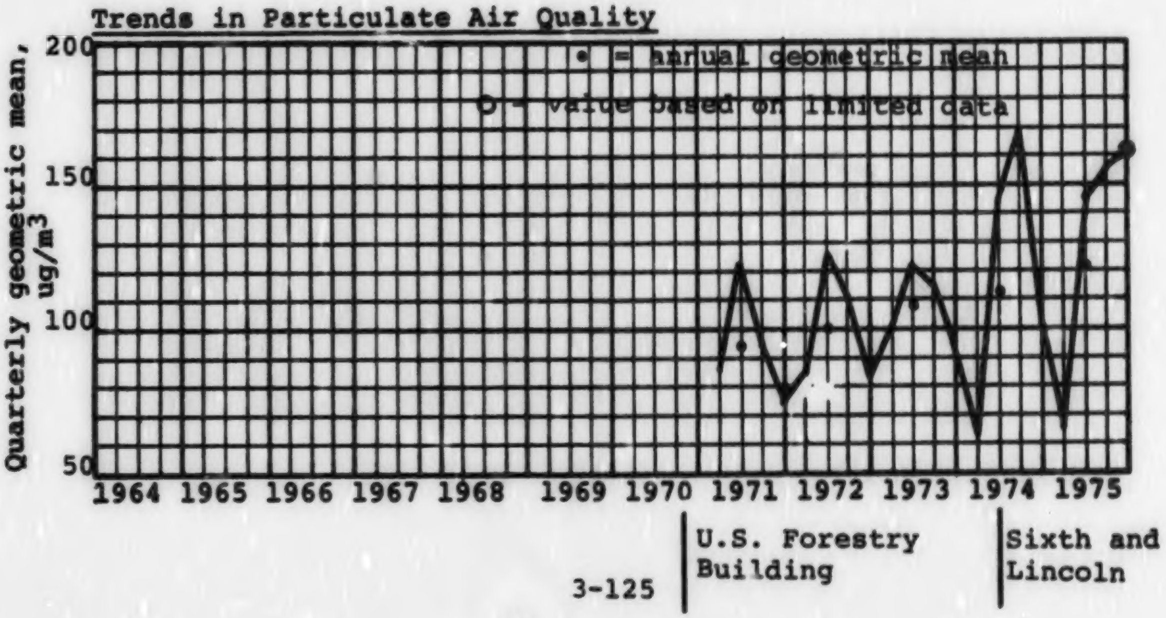
Localized pollution influences - The closest adverse influence is the boiler stack on the Municipal Building about 100 feet southeast. Overall, the surrounding streets were all sanded and unswept.

Physical interferences - There were no physical obstructions or tall structures which would affect the sampler's readings.

Terrain - The immediate vicinity is flat, while the surrounding area is composed of rolling hills and mountains in all directions from the sampler.

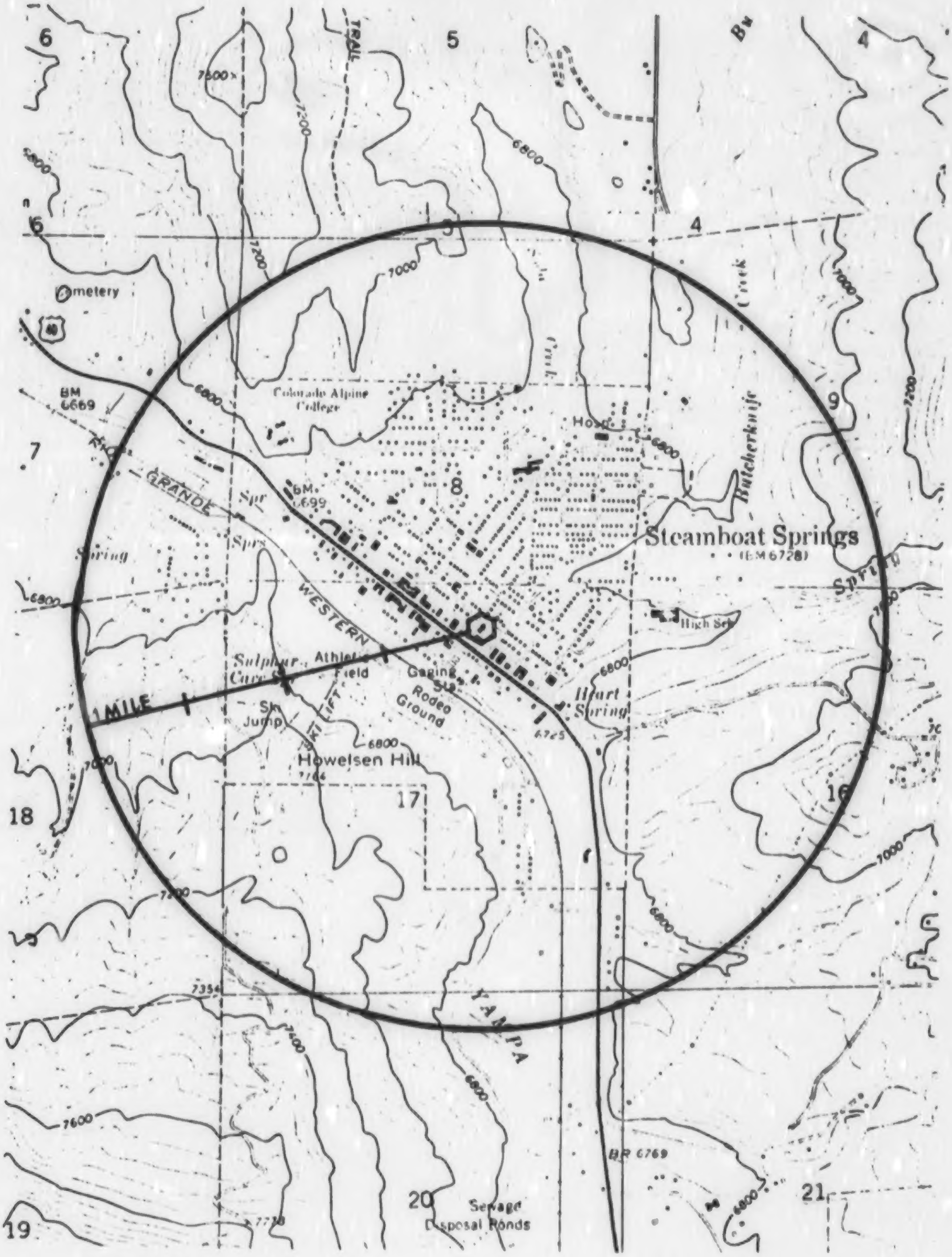
Comments - The site is placed well and is probably indicating representative values of air quality. Generally, all the streets in Steamboat Springs are dirty and unswept. The major particulate sources appear to be unpaved road shoulders and unpaved roads. The site was moved in mid-1974 from the U. S. Forestry building.

Trends in Particulate Air Quality



Steamboat Springs sampler viewed to the southeast.

Steamboat Springs sampler viewed to the west.


6
5
4
7600
7200
6800
7000
Cemetery
40
BM 6669
Colorado Alpine College
7
8
9
Rio GRANDE
WESTERN
BM 6699
Spr
Sprs
Spring
Steamboat Springs
BM 6728
High Sch
Hosp
Butcherknife Creek
Spring
Sulphur Cave
Athletic Field
Gaging Sta
Rodeo Ground
Heart Spring
Ski Jump
1 MILE
Howelsen Hill
7164
6725
18
17
16
7354
YAMPA
BR 6769
20
21
19
Sewage Disposal Ponds
7718
TRAIL

Steamboat Springs-Municipal Building.

Sources in Microinventory Area (1 mile radius)

Steamboat Springs

Population = 2,500
VMT = 18,500

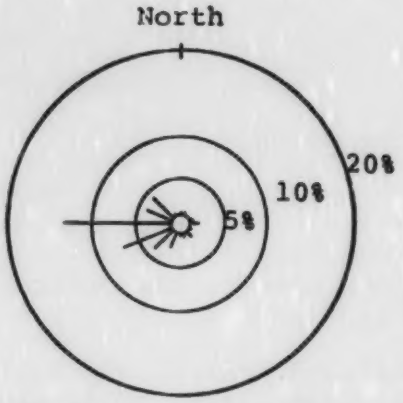
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Area sources:			
Fuel combustion	From TRW inventory report, 32% of county pop		12
Incineration			5
Other mobile			1
Motor vehicle exhaust	18500 VMT/day	0.59 g/VMT	4
Fugitive dust sources:			
Unpaved roads	4.9 mi, 40 ADT	3.1 lb/VMT	111
Unpaved shoulders	21 ac	0.41 t/ac/yr	9
Paved roads	18500 VMT/day	3.5 g/VMT	26
Unpaved parking lots	15 ac	1.2 lb/VMT	8
Cleared areas	20 ac	0.39 t/ac/yr	8
RR right-of-way	14 ac	0.5 t/ac/yr	7
Playgrounds	15 ac	0.4 t/ac/yr	6
Total emissions, ton/yr			197
Emission density, ton/sq mi/yr			63
Percent fugitive dust			89

Meteorological Data

Average annual
wind speed = 5.5 mph

Annual precipitation
1974 = 23.50"
1975 = 20.62"
Normal = 23.87"

No. of days
with precipitation = data not available



Steamboat Springs - 54% calm (< 2 mph)

Maximum Recorded Concentrations

1974 = 518 ug/m^3; 1975 = 407 ug/m^3

Summary and Conclusions

The Steamboat Springs site has been in operation for five years and recorded higher annual mean concentrations each year. In 1975, the annual mean was 121 ug/m^3. The sampler was moved to its present location in mid-1974. The readings show distinct seasonal variations, with high concentrations in the second and third quarters and low concentrations in the other two quarters when there is snow cover.

No point sources were identified in the survey area. Most of the area source emissions are fugitive dust--from unpaved roads and shoulders (61%) or paved roads (13%). The estimated emission density of 63 ton/sq mi/yr does not correspond with the ambient measurements at all, indicating that some major contributing sources were overlooked, their emissions were poorly estimated, or there is extreme site bias resulting from some nearby source. The site survey did not reveal any problem with the sampler location (see photographs), and it is unlikely that both of the sites that have been used in Steamboat Springs would be strongly biased.

In rechecking for possible contributing sources, it was found that fireplace burning of wood had not been included in the fuel combustion emissions. However, fireplace emissions would contribute most to winter concentrations and the high readings occur during the summer. Poor atmospheric dispersion in the mountainous terrain might cause emissions to have a greater impact than in an open area, but certainly not to the extent shown by these data. This site seems to be a legitimate non-attainment site, but it is difficult to determine the need for an SIP revision without first adequately identifying the sources contributing to the high concentrations and assessing their compliance status and further controllability.

3.27 RIFLE-MIDLAND HOTEL
SAROAD Site No. 06-0880-001

Description

General description - The sampler is located on a second story back porch of the Midland Hotel (111 East Third Avenue) approximately 15 feet above ground level. The hotel is centered in the central business district of town. The sampler is not near any major roads.

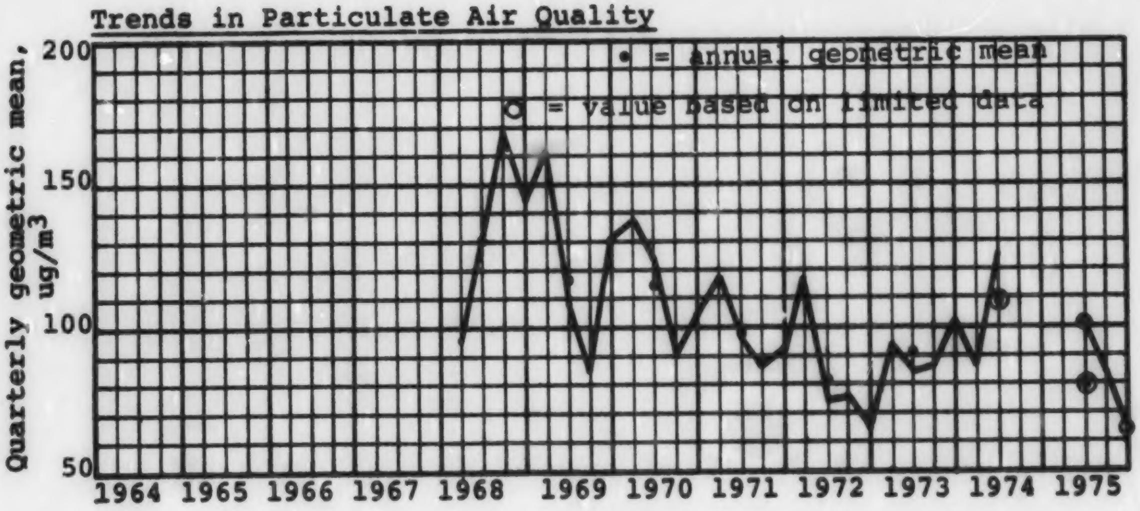
Localized pollution influences - Directly south of the sampler is a large, open, cleared area. There are no roof vents or other obvious influential sources nearby.

Physical interferences - The sampler on the porch is sheltered on three sides (north, west, south) by the hotel walls which rise one story above it.

Terrain - The immediate area surrounding the sampler is flat, while the majority of the town enclosed in the 1 mile radius survey area is hilly.

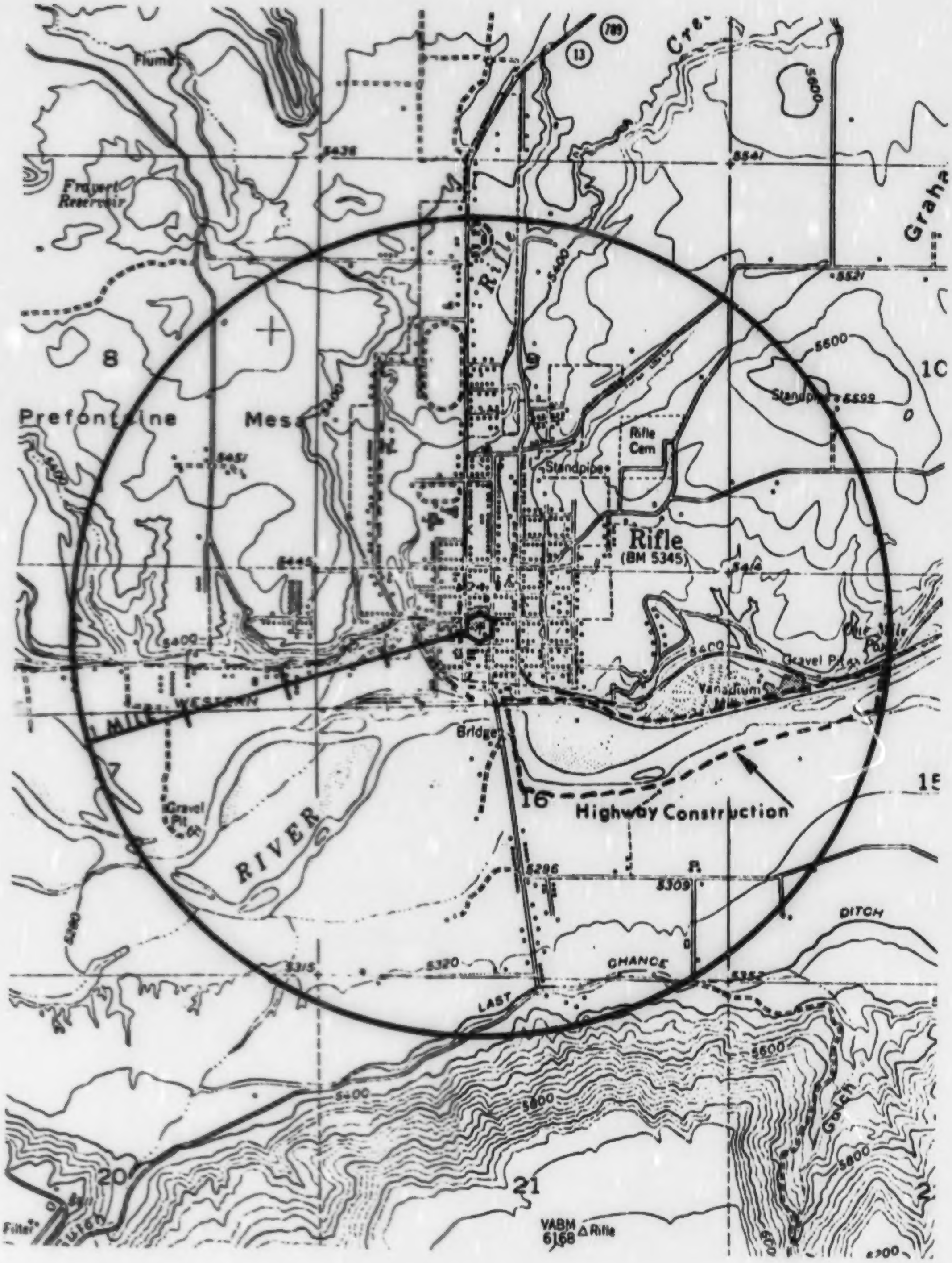
Comments - There is a significant potential for high fugitive dust emissions in the town, due to the quantity of unpaved shoulders and dusty streets. The sampler is well sited and, although very sheltered, probably measures a representative sample of the urban ambient air quality.

Trends in Particulate Air Quality



Rifle sampler viewed to the south.

Rifle sampler viewed to the northwest.


Flume
13
789
Cre
5800
Frayert Reservoir
5436
5541
Graha
5521
Rifle
5400
8
9
1C
Prefontaine Mesa
5451
5400
5600
Standpipe 5599
Rifle Cem
Standpipes
Rifle
(BM 5345)
5445
5400
Gravel Pits
Vanadium Mill
MILE
WESTERN
Bridge
7
16
15
Highway Construction
Gravel Pit
RIVER
5296
5309
DITCH
5280
5315
5320
CHANCE
5352
LAST
5400
5800
5600
Gulch
20
21
Filter
VABM 6168
△Rifle
5800
6200

Rifle-Midland Hotel.

Sources in Microinventory Area (1 mile radius)

Rifle
Population = 3,000
VMT = 17,400

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Area sources:			
Fuel combustion	From AQMA emission inventory report, 14.5% of county pop		6
Other mobile			3
Motor vehicle exhaust	17400 VMT/day	0.59 g/VMT	4
Fugitive dust sources:			
Unpaved roads	3.2 mi, 50 ADT	3.5 lb/VMT	102
Unpaved shoulders	26 ac	0.39 t/ac/yr	10
Paved roads	17400 VMT/day	3.5 g/VMT	25
Unpaved parking lots	10 ac	1.4 lb/VMT	6
Agriculture	19 ac	0.15 t/ac/yr	3
Construction	40 ac, 6 mo	0.44 t/ac/mo	106
Cleared areas	28 ac	0.37 t/ac/yr	10
RR right-of-way	14 ac	0.4 t/ac/yr	6
Playgrounds	4 ac	0.39 t/ac/yr	2
Total emissions, ton/yr			283
Emission density, ton/sq mi/yr			90
Percent fugitive dust			95

Meteorological Data

No local data available.

Maximum Recorded Concentrations

1974 = 545 ug/m^3; 1975 = 155 ug/m^3

Summary and Conclusions

The Rifle site has been in operation since 1968 and has shown highly variable readings on both a seasonal and annual basis. With limited available data in both 1974 and 1975, the annual means were 109 and 79 ug/m^3, respectively. The microinventory showed that fugitive dust sources, unpaved roads and construction in particular, were the major contributors in the survey area. No point sources with impact on the sampler were identified.

The estimated emission density of 90 ton/sq mi/yr does not support the measured ambient concentration of 79 ug/m^3 in 1975. The sites in western Colorado generally have lower emission densities than sites with comparable readings in the eastern part of the state, possibly indicating higher background concentrations in the very arid Western Slope areas. Evaluation of the sampling site revealed an unpaved parking area adjacent to the site and obstructions in the other directions, plus the erratic nature of the air quality data may be a sign of some interference.

If a full year of sampling data shows the Rifle site is still exceeding the primary standard, some emission reduction could probably be achieved by better enforcement of existing fugitive dust regulations. Since fugitive dust accounts for 95 percent of emissions in the survey area, there are no obvious new or more stringent regulations (as part of an SIP revision) that could produce further emission reductions.

3.28 GRAND JUNCTION-CITY HALL
SAROAD Site No. 06-0980-010

Description

General site description - The sampler is presently located on the roof of City Hall (Fourth and Rood) in the commercial central business district about 15 feet above ground level. It is removed about 100 feet from the streets on two sides.

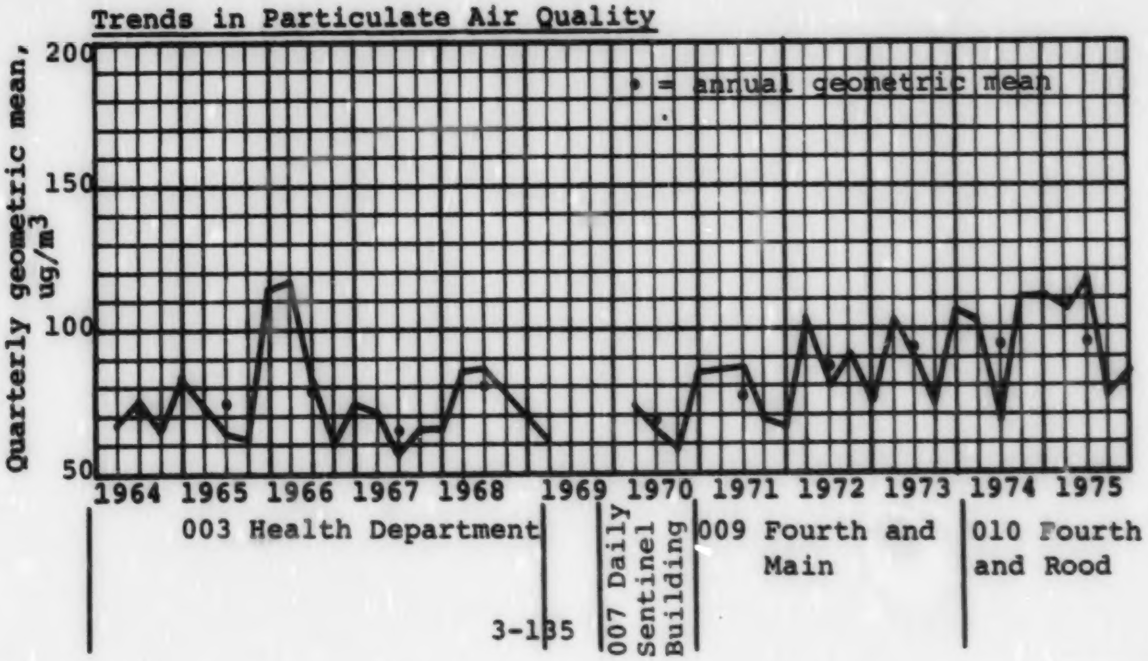
Localized pollution influences - There are no adverse influential sources in close proximity to the sampler with the exception of traffic in the central business district.

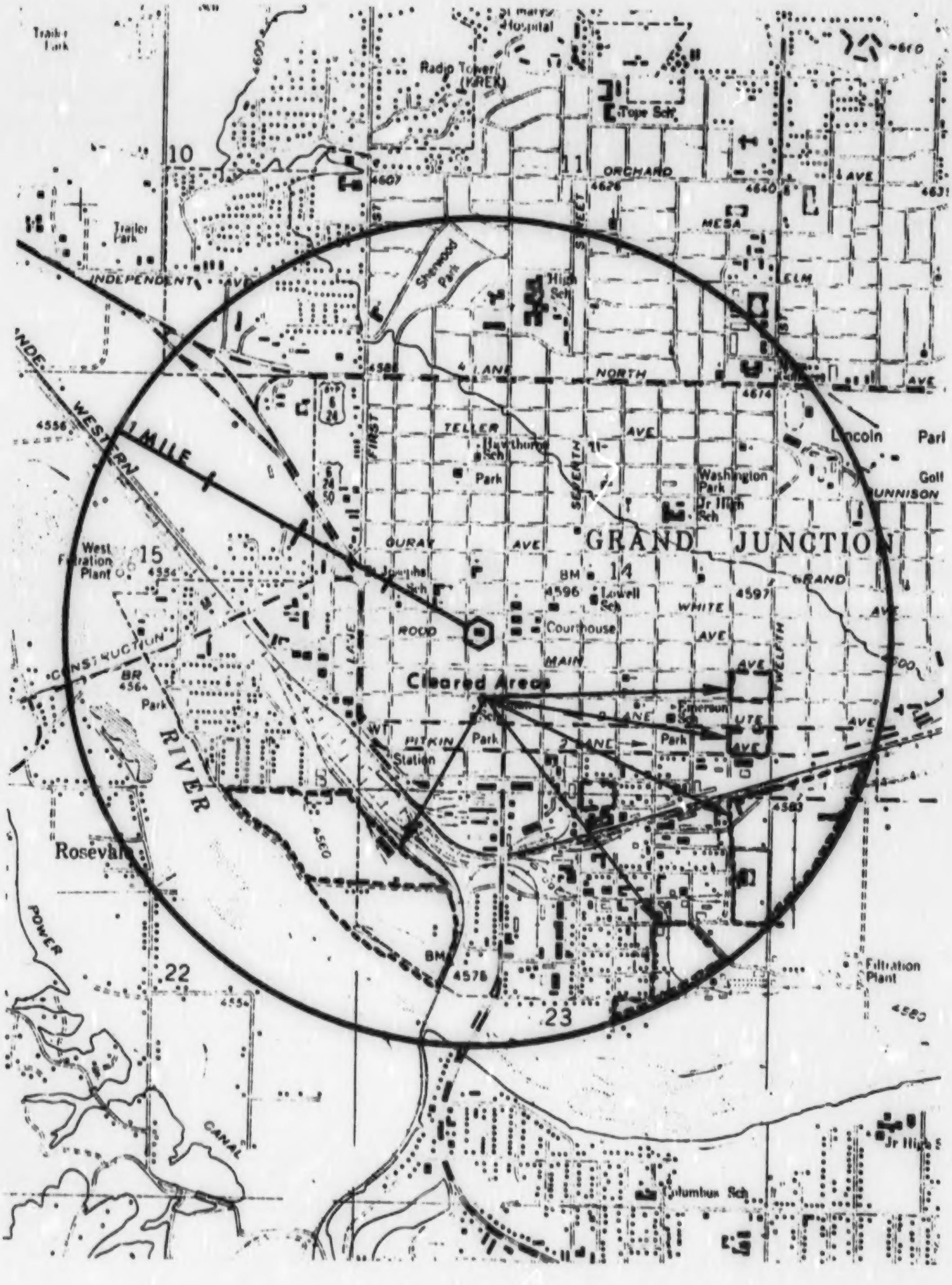
Physical interferences - There are no obvious obstructions near the sampler or tall buildings which would affect the readings.

Terrain - The area immediately surrounding the sampler is flat, as is the remainder of the 1 mile radius survey area down to the Colorado River, which borders the periphery of the area in the southwest quadrant.

Comments - In general, the area surrounding the sampler and the central business district is clean, while the north and south sectors of the survey area contain many cleared areas and unpaved parking lots. The sampler is probably situated in a good representative location. The sampler has been moved several times since 1964. The various locations are shown below on the graph.

Trends in Particulate Air Quality




1 MILE
Cleared Area
GRAND JUNCTION
Courthouse
RIVER
Rosevale
Lincoln Park
Washington Park
Sherwood Park
High Sch
St Marys Hospital
Radio Tower (KREX)
ORCHARD
MESA
ELM
NORTH
TELLER
OURAY
ROOD
MAIN
PITKIN
GRAND
WHITE
GUNNISON
INDEPENDENT AVE
CONSTRUCTION
WESTERN
Filtration Plant
Columbus Sch
10
11
14
15
22
23

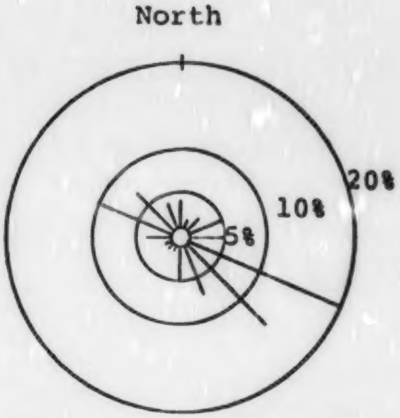
Grand Junction-City Hall.

Sources in Microinventory Area (1 mile radius)

Population = 6,600
Grand Junction VMT = 116,600

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Whitewater Building Materials			neg
Mesa Feed & Farm Supply			1
Mix-Mill Feed Factory			neg
Area sources:			
Fuel combustion	From AQMA emission inventory report, 11.4% of county pop		22
Other mobile			4
Motor vehicle exhaust	116600 VMT/day	0.59 g/VMT	28
Fugitive dust sources:			
Unpaved roads	1.7 mi, 30 ADT	3.5 lb/VMT	33
Unpaved shoulders	10.6 ac	0.43 t/ac/yr	5
Paved roads	116600 VMT/day	3.5 g/VMT	164
Unpaved parking lots	21 ac	1.4 lb/VMT	12
Construction	6 ac	0.43 t/ac/mo	10
Cleared areas	210 ac	0.41 t/ac/yr	86
RR right-of-way	25 ac	0.5 t/ac/yr	12
RR yards	61 ac	0.5 t/ac/yr	30
Playgrounds	15 ac	0.43 t/ac/yr	6
Total emissions, ton/yr			413
Emission density, ton/sq mi/yr			131
Percent fugitive dust			87

Meteorological Data



Grand Junction Airport - 4% calm

Average annual
  wind speed = 8.2 mph

Annual precipitation
    1974 = 8.20"
    1975 = 9.18"
  Normal = 8.41"

No. of days
  with precipitation = 90

Maximum Recorded Concentrations

1974 = 361 ug/m^3; 1975 = 522 ug/m^3

Summary and Conclusions

The Grand Junction site has been at four different locations during the past 12 years. Since 1971, annual mean concentrations have exceeded the primary standard every year and have shown a steady increase. The air quality data do not exhibit consistent seasonal variations. The present site location on the City Hall building seems to be representative of the urban area and free of local biases.

Major contributing sources identified by the microinventory were paved streets (40%), cleared areas (21%), unpaved roads (8%), and motor vehicle exhaust (7%). Point source contributions were less than one percent. The steady increase in ambient concentrations in recent years provides some confirmation of the major impact of the traffic-related emissions. While the estimated emission density of 131 ton/sq mi/yr does not appear adequate to generate an annual average concentration of 96 ug/m^3, this same relationship has been found at other western Colorado non-attainment sites such as Rifle and Steamboat Springs.

Reentrained dust from streets could be reduced by improved street cleaning and some other fugitive dust emissions could be reduced by more comprehensive enforcement of existing state regulations. The latter control measure would not require an SIP revision. It is possible that the combined effect of these two measures would still not result in attainment because of the low control efficiencies achievable for most fugitive dust sources.

3.29 TRACT CB TRAILER 020

Description

General site description - There are four samplers located on the roof of the air quality equipment trailer (10 feet above ground level) in a field next to the Redd Ranch. The surrounding area is ranchland, fields, and wooded areas removed from any development.

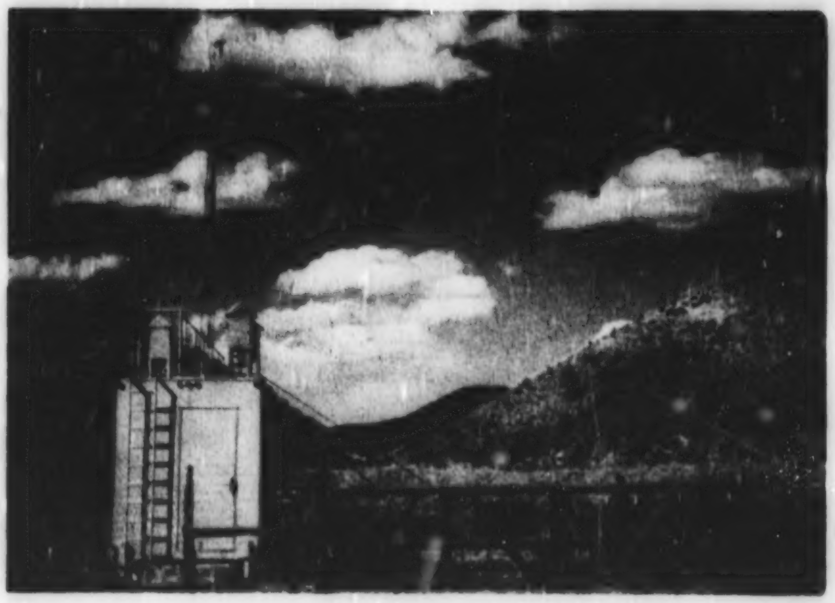
Localized pollution influences - There are no major influential sources with the exception of a 500 foot wide strip of bare earth parallel to and across the road from the sampler site (300 feet).

Physical interferences - There are no physical interferences in the vicinity of the samplers.

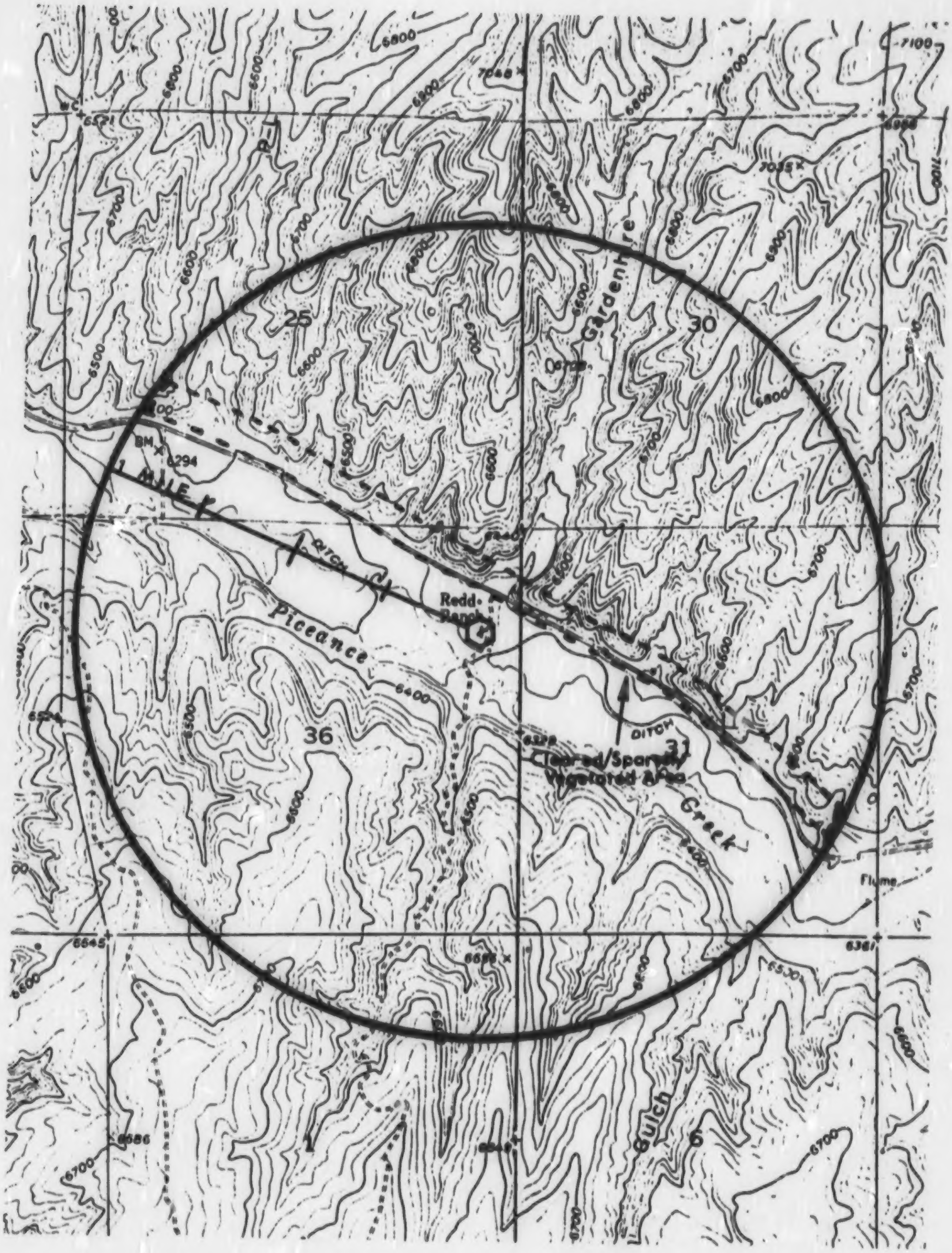
Terrain - The entire tract area and site location can be characterized as rolling to semi-mountainous. The site actually sits in a valley between two ridges.

Comments - The site appears to present a good indication of background baseline air quality in Tract CB.

Tract CB Trailer 020 sampler viewed to the south.



Tract CB Trailer 020 sampler viewed to the north.


25
30
Gardenhire
BM 6294
1 MILE
DITCH
Redd Ranch
Piceance
Creek
36
31
DITCH
Cleared/Sparsely Vegetated Area
Flume
Gulch
1
6
6400
6500
6600
6700
6800
7100

Tract CB Trailer 020.

Sources in Microinventory Area (1 mile radius)

Tract CB 020

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Area sources:			
Fuel combustion			neg
Incineration			neg
Other mobile			neg
Motor vehicle exhaust	200 VMT/day	0.59 g/VMT	neg
Fugitive dust sources:			
Unpaved roads	2.2 mi, 4 ADT	3.5 lb/VMT	6
Unpaved shoulders	4.8 ac	0.41 t/ac/yr	2
Paved roads	Est 100 veh/dy x 2 VMT/veh	3.5 g/VMT	neg
Cleared areas	71 ac	0.39 t/ac/yr	28
Total emissions, ton/yr			36
Emission density, ton/sq mi/yr			11
Percent fugitive dust			100

Meteorological Data

No local data available.

Summary and Conclusions

This site was included in the particulate non-attainment study because some initial readings exceeded the 24-hour secondary standard, even though the station was established to measure background air quality prior to any development of the area. The site survey showed that the site was indeed a good location for a background monitor, having very few identifiable particulate emission sources and an estimated emission density of only 11 ton/sq mi/yr. Any short-term excursions above the standard would have to be attributed to either local natural sources (wind erosion across unprotected soil surfaces) or long-range transport of dust. Readings taken at this site would provide good background values for the Rifle sampling site.

3.30 TRACT CB TRAILER 022

Description

General site description - There are four samplers located on the roof of the air quality equipment trailer (10 feet above ground level) in a cattle grazing field next to the Gerald Oldland Ranch. It is 300 feet from the paved access road. The surrounding area is fields, ranchland, and wooded hillsides removed from any development.

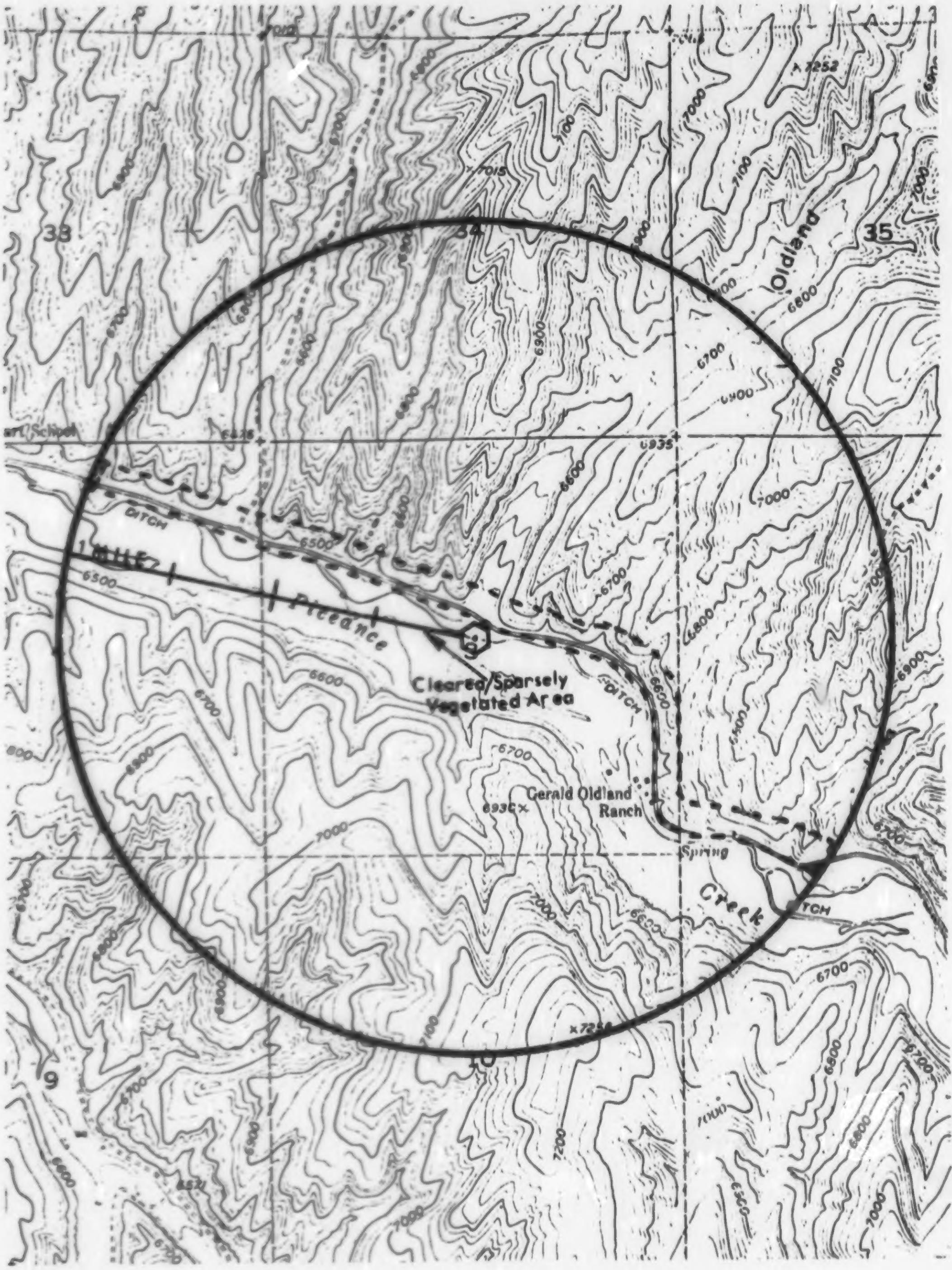
Localized pollution influences - There are no major influential sources with the exception of a 500 foot wide strip of uncovered ground parallel to and across the road from the sampler site (300 feet).

Physical interferences - There are no physical interferences or obstructions in the vicinity of the samplers.

Terrain - The entire tract area and site location can be characterized as rolling to semi-mountainous land. The site is situated in a valley between two ridges.

Comments - The sampling site is completely isolated and probably presents an excellent indication of background baseline air quality in Tract CB.

Tract CB Trailer 022 sampler viewed to the south-southeast.


33
34
35
9
10
Oldland
1 Mile
Piceance
Creek
DITCH
5
Cleared/Sparsely Vegetated Area
Gerald Oldland Ranch
Spring

Tract CB Trailer 022.

Sources in Microinventory Area (1 mile radius)

Tract CB 022

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Area sources:			
Fuel combustion			neg
Incineration			neg
Other mobile			neg
Motor vehicle exhaust	200 VMT/day	0.59 g/VMT	neg
Fugitive dust sources:			
Unpaved roads	0.8 mi, 4 ADT	3.5 lb/VMT	2
Unpaved shoulders	5.5 ac	0.41 t/ac/yr	2
Paved roads	Est 100 veh/dy x 2 VMT/veh	3.5 g/VMT	neg
Cleared areas	83 ac	0.39 t/ac/yr	33
Total emissions, ton/yr			37
Emission density, ton/sq mi/yr			12
Percent fugitive dust			100

Meteorological Data

No local data available.

Summary and Conclusions

This site was included in the non-attainment study for the same reasons as the Trailer 020 site and yielded the same findings: the site is a good background sampling location; there are no significant anthropogenic sources of particulate in the vicinity of the sampler; and any short-term excursions above the standard could only be attributed to natural sources or long-range transport.

3.31 GREAT FALLS-FIRE STATION
SAROAD Site No. 27-0660-009

Description

General site description - The sampler is located on the roof of the fire station (First Avenue, South and Ninth Street, South) about 20 feet above ground level. It is in an area of residential/light commercial land use and fronts on a paved alley immediately adjacent to the building.

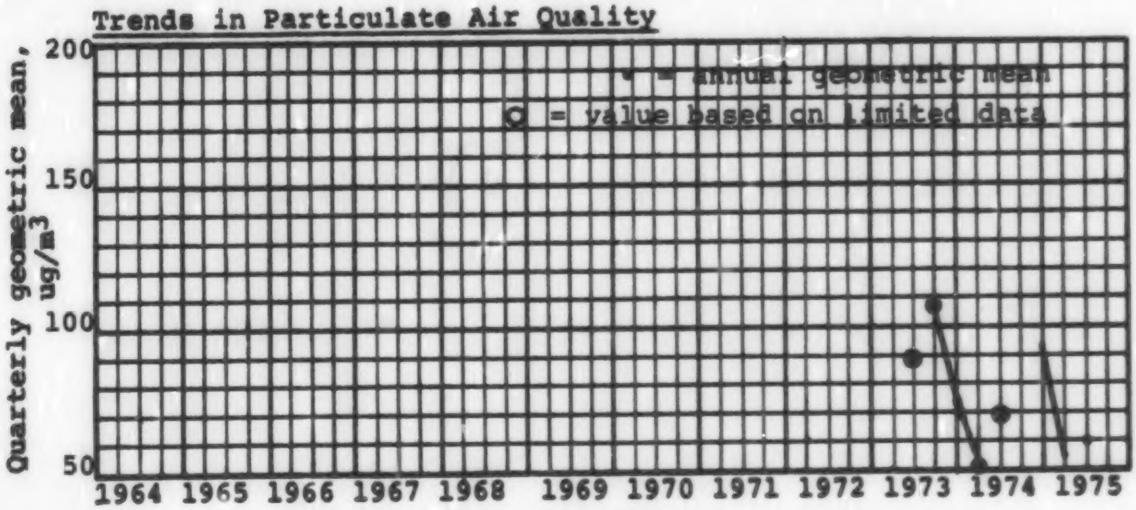
Localized pollution influences - There are several unpaved driveways and a small incinerator stack 50 feet to the south of the sampler.

Physical interferences - The fire station wall extends upward 20 or more feet about 10 feet east of the sampler and effectively blocks air movement from that direction.

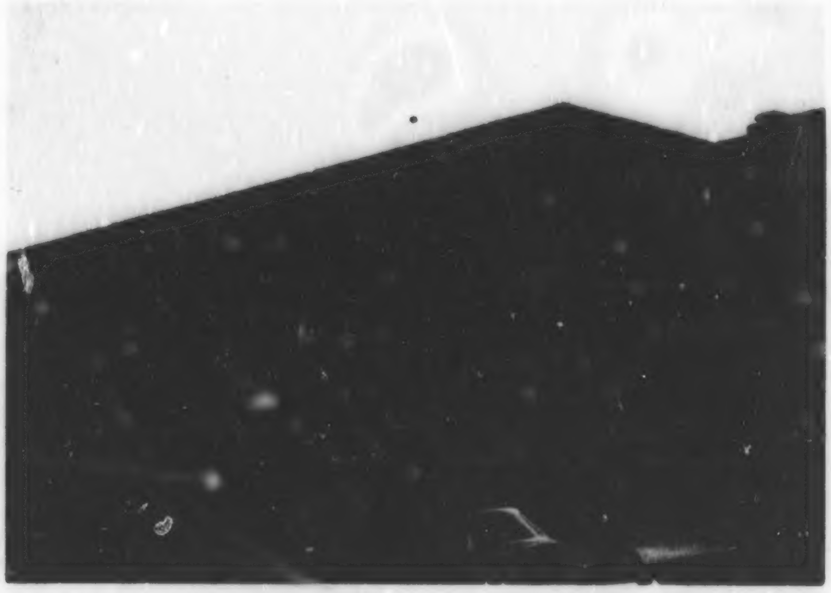
Terrain - The area in the immediate vicinity of the sampler is flat to rolling and slopes down into the Missouri River Valley one mile to the west.

Comments - The major downtown streets appeared swept and flushed, but the majority of other streets in the city were not. Visible suspended dust from street traffic was noted. With the exception of the physical interference, the sampler probably gives representative samplings of air quality.

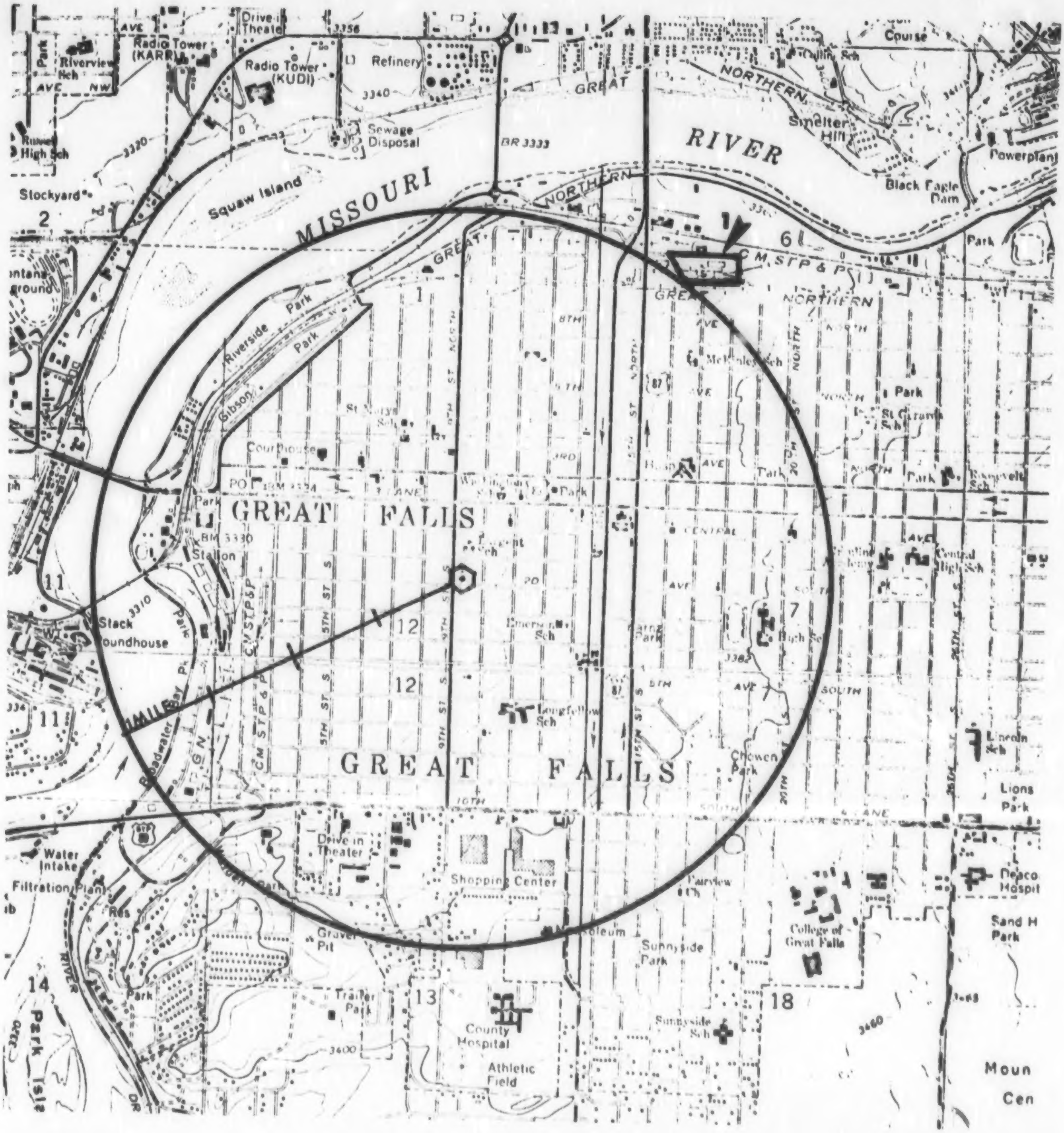
Trends in Particulate Air Quality



Great Falls sampler viewed to the northwest.



Great Falls sampler viewed to the northeast.


MISSOURI
RIVER
GREAT FALLS
GREAT FALLS
1 MILE
Radio Tower (KARR)
Radio Tower (KUDI)
Drive-in Theater
Refinery
Sewage Disposal
Riverview Sch
Stockyard
Squaw Island
Smelter Hill
Black Eagle Dam
Powerplant
GREAT NORTHERN
C M ST P & P
Riverside Park
Gibson Park
Courthouse
St Marys Sch
Washington Sch
Station
Stack
Roundhouse
Broadwater Bay
McKinley Sch
St Gerard Sch
Roosevelt Sch
Central High Sch
High Sch
Emerson Sch
Longfellow Sch
Chowen Park
Lincoln Sch
Lions Park
Drive-in Theater
Shopping Center
Fairview Ch
College of Great Falls
Deaconess Hospital
Sand H Park
Water Intake
Filtration Plant
Gravel Pit
Trailer Park
County Hospital
Athletic Field
Sunnyside Park
Sunnyside Sch
Mausoleum
Park Isle
Moun
Cen
1
2
6
7
11
12
13
14
18

Great Falls-Fire Station.

Sources in Microinventory Area (1 mile radius)

Great Falls

Population = 20,400
VMT = 127,600

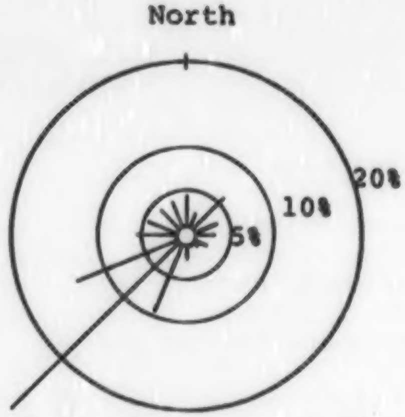
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Concrete Service			neg
1 Ceretana Feeds			70
Western Grain Exchange			neg
General Mills			32
Great Falls Redi-Mix			neg
Phillips Refinery	Outside mile radius		72
Burlington Northern Maintenance Shop	Outside mile radius		unknown
Area sources:			
Fuel combustion	1 ton/200 pop		102
Other mobile	13 gal/capita	25 lb/1000 gal	3
Motor vehicle exhaust	127600 VMT/day	0.59 g/VMT	30
Fugitive dust sources:			
Unpaved roads	2.1 mi, 20 ADT	3.3 lb/VMT	25
Unpaved shoulders	1.1 mi	0.26 t/ac/yr	1
Paved roads	127600 VMT/day	3.5 g/VMT	180
Unpaved parking lots	55 ac	1.3 lb/VMT	30
Cleared areas	8 ac	0.25 t/ac/yr	2
RR right-of-way	14 ac	0.3 t/ac/yr	4
RR yards	47 ac	0.3 t/ac/yr	14
Playgrounds	2 ac	0.26 t/ac/yr	1
Total emissions, ton/yr			494
Emission density, ton/sq mi/yr			157
Percent fugitive dust			52

Meteorological Data

Average annual
wind speed = 13.2 mph

Annual precipitation
1974 = 15.26"
1975 = 25.24"
Normal = 14.99"

No. of days
with precipitation = 100



Great Falls Airport - 1.5% calm

Maximum Recorded Concentrations

1974 = 477, second high = 288 ug/m^3
1975 = 310, second high = 208 ug/m^3

Summary and Conclusions

The Great Falls site began operation in the third quarter of 1973. Until 1975, only two quarters of data with sufficient samples to be statistically accurate were generated. The data for 1975 show an annual mean of 60 ug/m^3 and the second highest 24-hour reading of 208 ug/m^3, both well below the corresponding primary standards.

The estimated emission density is 157 ton/sq mi/yr, lower than would be expected of a non-attainment site. There are no significant localized sources which would inflate the sampler's readings.

The major sources contributing to the ambient concentrations are several medium sized point sources in or near the mile radius, reentrained dust from paved streets (36%), and residential/commercial fuel combustion (21%). Fugitive dust sources other than paved streets contribute about 15 percent of the emissions in the survey area. If subsequent air quality data would show that emission reductions are necessary, two potential strategies would be improved street cleaning and more stringent point source regulations. However, current data indicate that Great Falls should no longer be classified as a non-attainment area.

3.32 BUTTE-GREELEY SCHOOL
SAROAD Site No. 27-0160-005

Description

General site description - The sampler is located on the roof of the Greeley School (Silver Bow Boulevard) about 15 feet above ground level. The site is in an older residential section of town, approximately 1/3 mile from the Weed concentrator and 1/2-1 mile from the Berkeley Pit area.

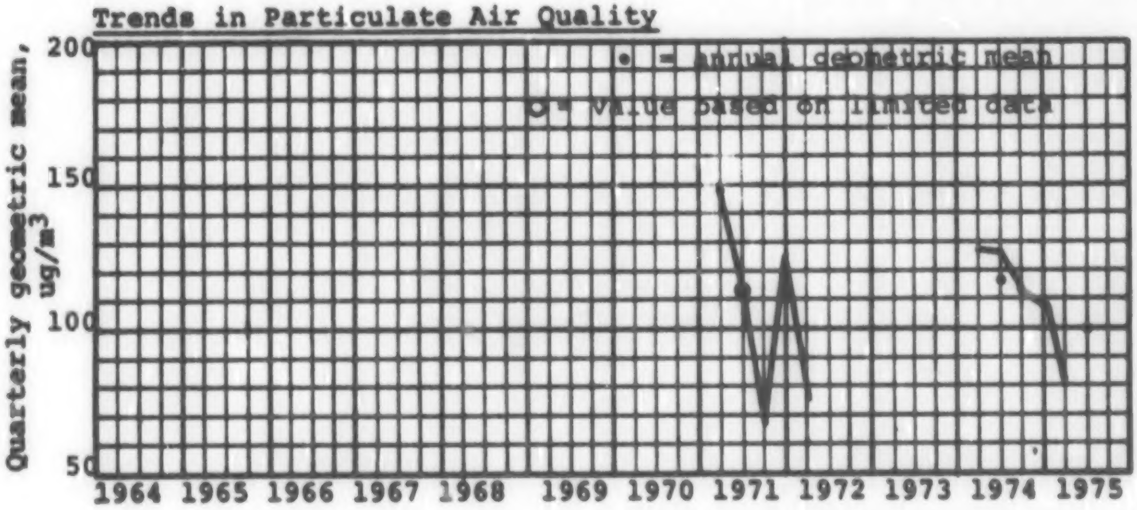
Localized pollution influences - In the immediate vicinity, an unpaved road runs in front of the school 25 feet from the sampler and a dirt playground is adjacent to the school to the west. There is a boiler vent on the school roof 25 feet from the sampler.

Physical interferences - The school roof extends upward and shelters the sampler on two sides.

Terrain - The entire area, both in the immediate vicinity of the sampler and the surrounding periphery of the survey area, is flat. The Berkeley Pit is a predominant depression to the north.

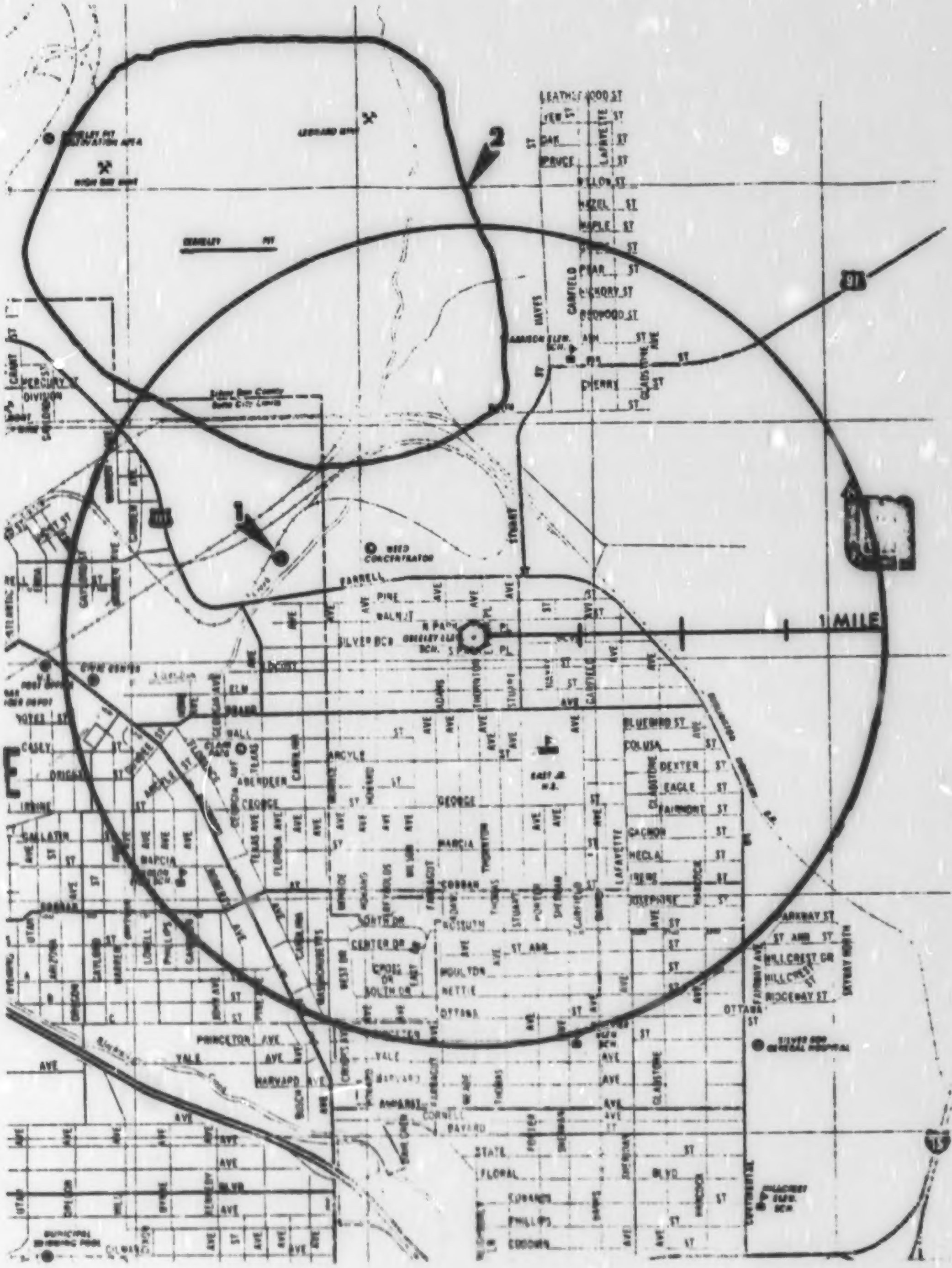
Comments - The entire site area, town, and mine area are extremely dirty and dusty with a high potential for fugitive dust emissions. The sampler is probably yielding representative readings for Butte, although it may be biased somewhat by the unpaved road in front of the school and the playground.

Trends in Particulate Air Quality



Butte sampler viewed to the south.

Butte sampler viewed to the southeast.


2
1
1 MILE
GREELEY PIT
LEONARD MINE
WEED CONCENTRATOR
GREELEY ELEM. SCH.
SILVER BOW
GARRISON ELEM. SCH.
Silver Bow County
Butte City Limits
CIVIC CENTER
POST OFFICE
LEATHERWOOD ST
YEW ST
OAK ST
SPRUCE ST
WILLOW ST
HAZEL ST
MAPLE ST
PEAR ST
HICKORY ST
REDWOOD ST
ASH ST
CHERRY ST
GARFIELD
LAFAYETTE
GLADSTONE AVE
HAYES
STUART
FARRELL
PINE
WALNUT
ELM
LOCUST
GRAND
WALL
ARGYLE
ABERDEEN
GEORGE
MARCIA
COBBAN
BLUEBIRD ST
COLUSA
DEXTER
EAGLE
FAIRMONT
GAGNON
HECLA
IRENE
JOSEPHINE
PARKWAY ST
HILLCREST DR
RIDGEWAY ST
SKYWAY NORTH
EAST JR. H.S.
MOULTON
NETTIE
OTTAWA
PRINCETON AVE
YALE
HARVARD AVE
CORNELL
STATE
FLORAL
FLORIDA AVE
TEXAS AVE
CENTER DR
MERCURY ST
DIVISION
CASEY
GALLATIN
SILVER BOW GENERAL HOSPITAL
HILLCREST ELEM. SCH.
MUNICIPAL SWIMMING POOL
91
15

Butte-Greeley School.

Sources in Microinventory Area (1 mile radius)

Butte

Population = 7,300
VMT = 65,800

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Gillman Excavating			neg
Continental Concrete			neg
Weed Concentrator			neg
1 Berkeley Pit Crusher			283
2 Berkeley Pit	See Sept 1975 PEDCo report		6080
Area sources:			
Fuel combustion	From AQMA emission inventory report, 16.9% of county pop		12
Other mobile			6
Motor vehicle exhaust	65800 VMT/day	0.59 g/VMT	16
Fugitive dust sources:			
Unpaved roads	3.0 mi, 50 ADT	3.65 lb/VMT	100
Unpaved shoulders	27 mi	0.19 t/ac/yr	13
Paved roads	65800 VMT/day	3.59 g/VMT	93
Road sanding			
Unpaved parking lots	25 ac	1.5 lb/VMT	15
Cleared areas	600 ac	0.18 t/ac/yr	110
RR right-of-way	16 ac	0.2 t/ac/yr	4
RR yards	31 ac	0.2 t/ac/yr	7
Playgrounds	14 ac	0.19 t/ac/yr	3
Total emissions, ton/yr			6742
Emission density, ton/sq mi/yr			2146
Percent fugitive dust			94[a]

[a] includes most emissions from Berkeley Pit

Meteorological Data

No local data available.

Maximum Recorded Concentrations

1974 = 966, second high = 560 ug/m^3
1975 = 368, second high = 302 ug/m^3

Summary and Conclusions

The three full years of sampling at this site have all produced annual means of 100 ug/m^3 or greater. Because the site does not have a long record of continuous operation, conclusions cannot be drawn relative to air quality trends or seasonal variations. The survey area has a very high estimated emission density of 2146 ton/sq mi/yr, which would support even higher ambient concentrations than those observed. However, 90 percent of the emissions are from the Berkeley Pit which lies only partially within the one mile radius circle. Also, emissions from the pit are from various depths up to 1300 feet and are already quite dispersed by the time they reach ground level. Emission density resulting from all sources except the pit is 211 ton/sq mi/yr.

The other contributing sources include the crushing and conveying operations for the pit, unpaved roads, cleared areas, and reentrained dust from paved roads. Although it is not apparent from the available data, emission reductions from sources other than the Berkeley Pit would probably be required in order to obtain the standards. An SIP revision in the form of fugitive dust control regulations would be one feasible approach.

The site appears to be strongly influenced by a nearby unpaved road and a dirt playground. However, it is likely that the site would continue to exceed the standards without these local biases.

3.33 MISSOULA-COURTHOUSE
SAROAD Site No. 27-1100-001

Description

General site description - The sampler is located on the roof of the Courthouse, approximately 40 feet above ground level. It is in a commercial area and surrounded on all sides by paved streets, with a paved parking lot on one side bordering the building.

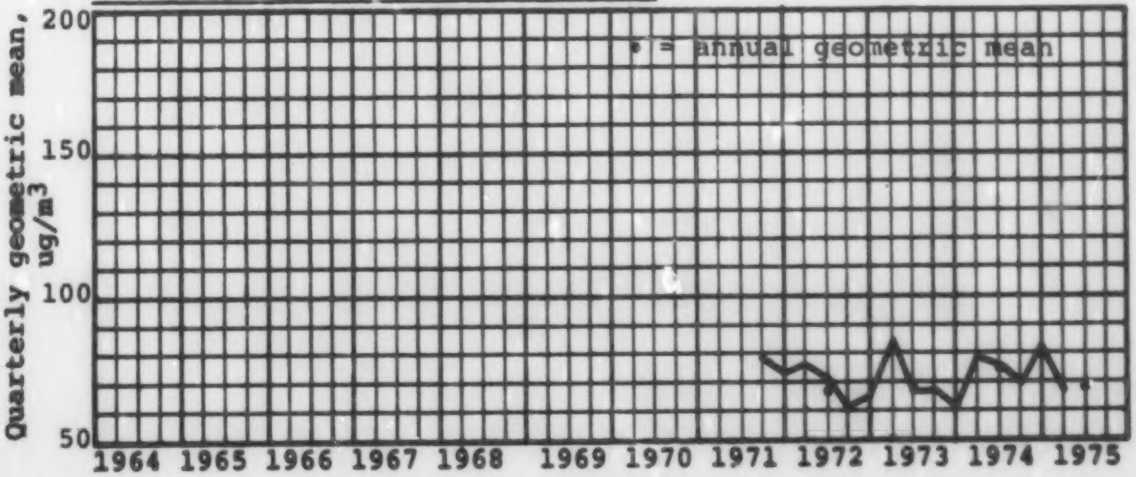
Localized pollution influences - There are no localized sources other than traffic in the immediate vicinity of the sampler.

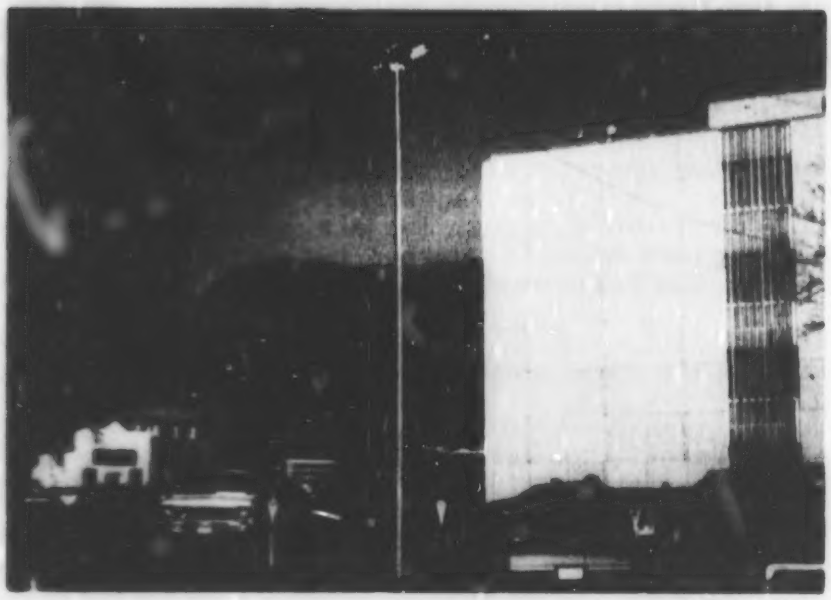
Physical interferences - No obstructions or taller buildings were noted in the vicinity of the sampler which could affect the readings.

Terrain - The immediate site area is flat, while the northeast portion of the 1 mile radius area rises in a steep gradient. The elevation of the sampler is about 3,200 feet msl.

Comments - This sampler is probably giving a fairly representative sampling of the ambient air quality in Missoula. It is well situated and removed from severe localized pollution influences.

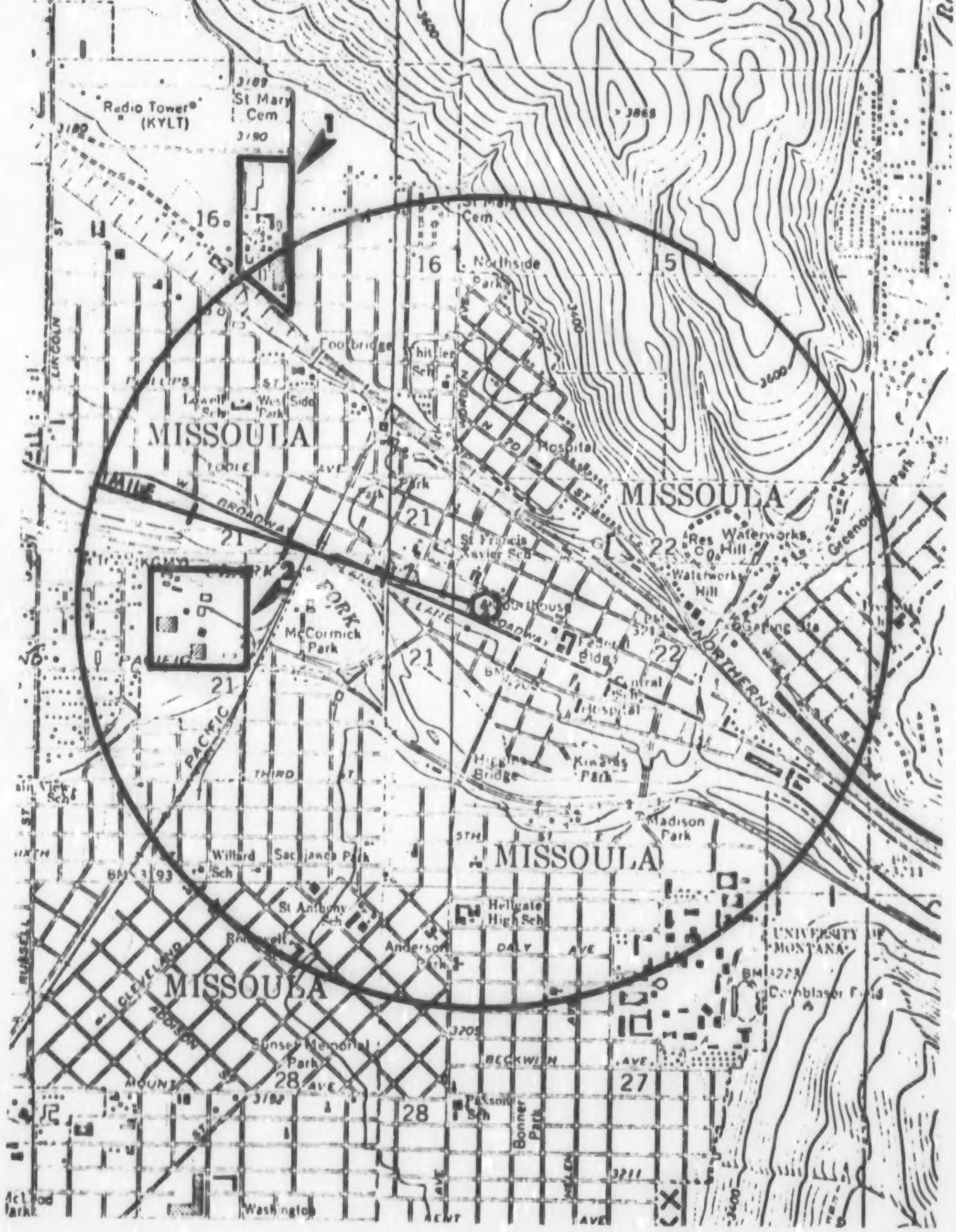
Trends in Particulate Air Quality





Missoula sampler viewed to the east.

Missoula sampler viewed to the south.


Radio Tower (KYLT)
St Mary Cem
1
2
16
15
21
22
27
28
Northside Park
Footbridge
Whittier Sch
West Side Park
Lowell Sch
MISSOULA
Hospital
St Francis Xavier Sch
Courthouse
McCormick Park
FORK
BROADWAY
Res Waterworks Hill
Waterworks Hill
Greenough Park
NORTHERN
PACIFIC
Central Sch
Hospital
Higgins Bridge
Kiwanis Park
Madison Park
THIRD
Willard Sch
Sacajawea Park
St Anthony Sch
Roosevelt
Hellgate High Sch
Anderson Park
DALY AVE
UNIVERSITY OF MONTANA
Dornblaser Field
CLEVELAND
Sunset Memorial Park
BECKWITH AVE
Bonner Park
Washington
MOUNT AVE
LINCOLN
RUSSELL
3600
3868

Missoula-Courthouse.

Sources in Microinventory Area (1 mile radius)

Missoula

Population = 11,800
VMT = 120,000

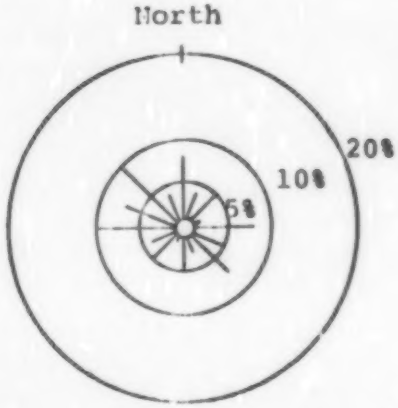
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Ceretona Feeds			neg
1 Missoula White Pine Sash			164
2 Intermountain Company			49
Montana Feed & Grain			neg
Area sources:			
Fuel combustion	From AQMA emission inventory report, 18.5% of county pop		42
Other mobile			13
Motor vehicle exhaust	120000 VMT/day	0.59 g/VMT	28
Fugitive dust sources:			
Unpaved roads	2.5 mi, 30 ADT	3.0 lb/VMT	41
Unpaved shoulders	6.6 mi	0.1 t/ac/yr	2
Paved roads	120000 VMT/day	3.59 g/VMT	169
Unpaved parking lots	35 ac	1.2 lb/VMT	17
Cleared areas	12 ac	0.10 t/ac/yr	1
RR right-of-way	47 ac	0.1 t/ac/yr	5
RR yards	34 ac	0.1 t/ac/yr	4
Total emissions, ton/yr			535
Emission density, ton/sq mi/yr			170
Percent fugitive dust			45

Meteorological Data

Average annual
wind speed = 5.6 mph

Annual precipitation
1974 - 10.76"
1975 = 18.48"
Normal = 13.34"

No. of days
with precipitation = 124



Missoula Airport - 12% calm

Maximum Recorded Concentrations

1974 = 420, second high = 361 ug/m^3
1975 = 240, second high = 202 ug/m^3

Summary and Conclusions

The Missoula Courthouse site has had annual means in the high 60's for three of its four years of operation. During 1974, it marginally exceeded the primary standard with an annual mean of 75.5 ug/m^3. The estimated emission density of 170 ton/sq mi/yr seems to confirm the 1975 annual mean of 69 ug/m^3.

The major contributors to particulate concentrations at this site are two point sources (31% and 9%) and reentrained dust from paved streets (32%). The point sources are indicated to be in compliance with existing regulations. If, based on 1976 air quality data, slight emission reductions would be necessary to attain the standard, these could be achieved by improved street cleaning, fugitive dust control regulations, or more stringent regulations for the wood products industry. However, at present no SIP revision or emission reductions appear to be required to attain the primary standard.

3.34 LIBBY-LARCH STREET
SAROAD Site No. 27-0900-009

Description

General site description - The sampler is located on the roof of a small shed at a private residence (120 West Larch) about 7 feet above ground level. The site is in an older residential area and is set back 100 feet from the road.

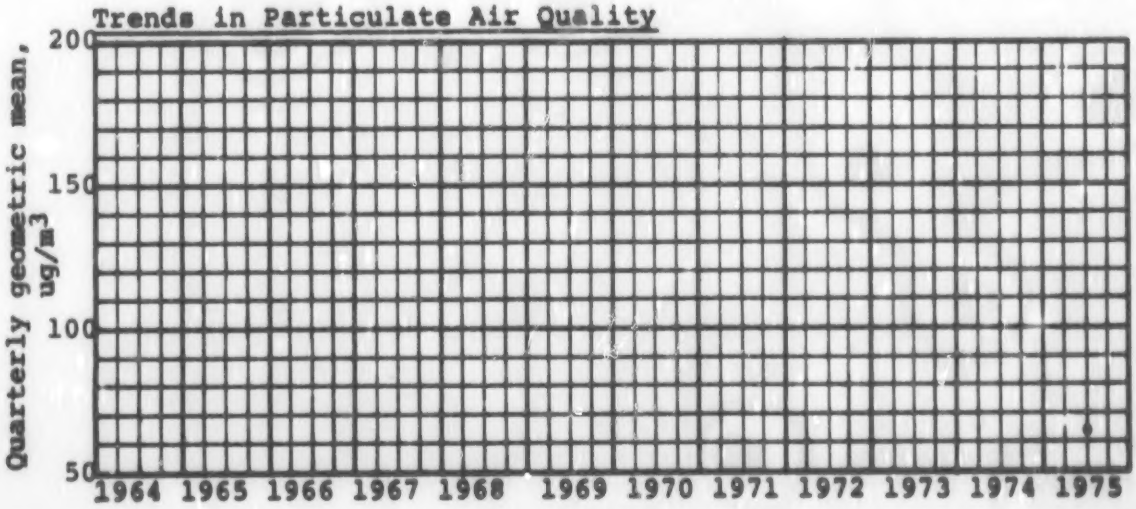
Localized pollution influences - A small dirt alley runs behind the shed, 15 feet from the sampler, probably not heavily travelled. There is a dirt driveway leading to the shed, 25 feet from the sampler.

Physical interferences - The site is sheltered in the backyard by a high concentration of pine trees.

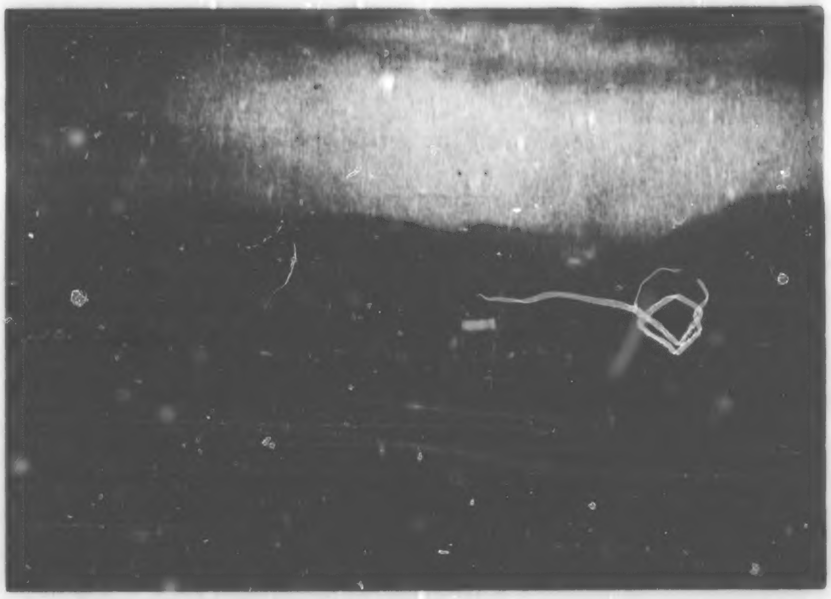
Terrain - The immediate site area is flat, while steep hills rise to the south. The Kootenai River borders the 1 mile radius survey area to the northeast.

Comments - The town is very dusty, overall. Open burning is very prevalent in April. The sampler is probably reading representative samples of air quality in the area.

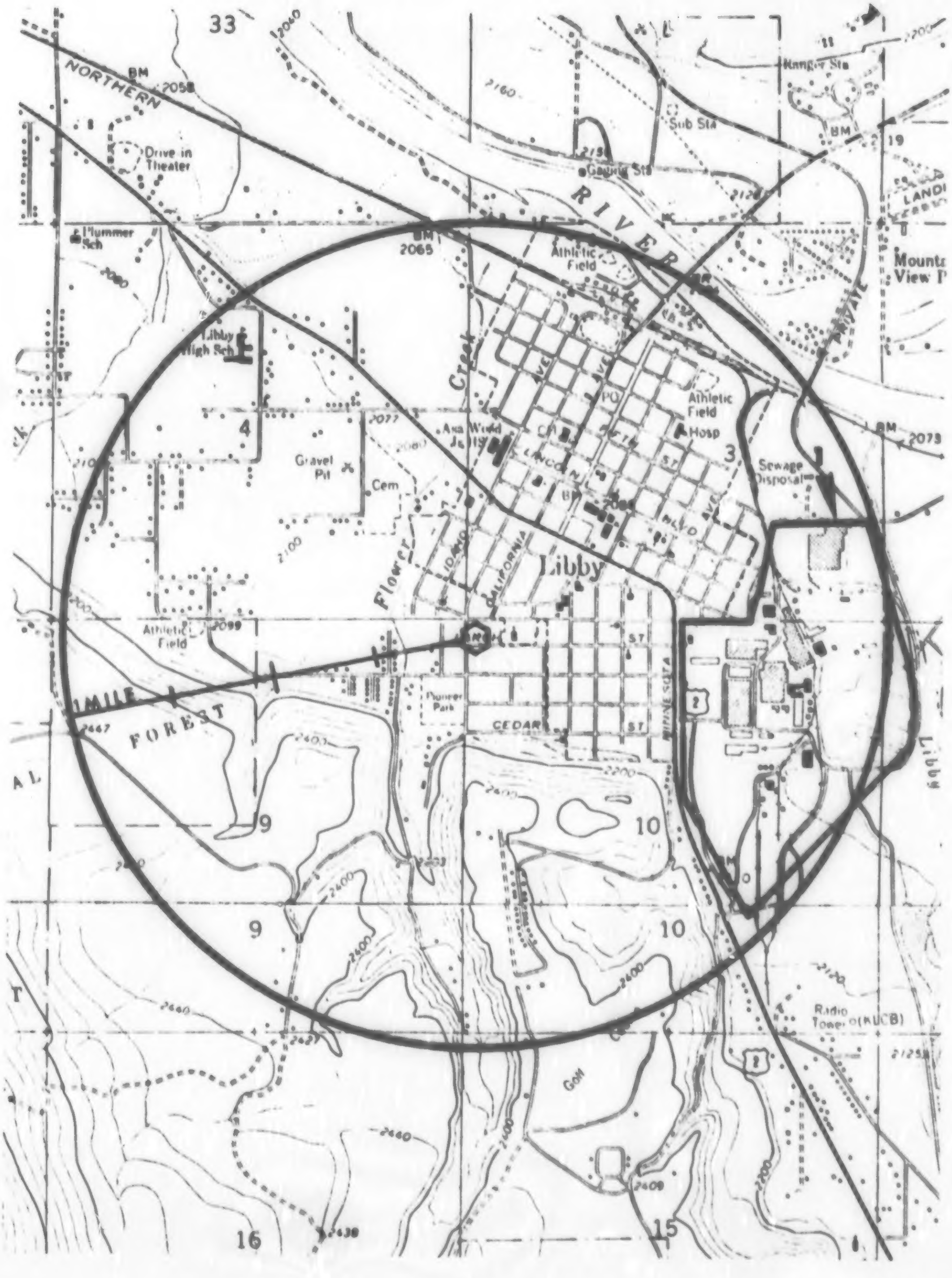
Trends in Particulate Air Quality



Libby sampler viewed to the west.



St. Regis Paper Company, located one mile east of the sampler site, viewed to the northeast.


33
NORTHERN
BM 2058
Drive in Theater
Plummer Sch
Libby High Sch
RIVER
Sub Sta
Gaging Sta
Ranger Sta
BM
19
Athletic Field
BM 2065
Creek
PO
Athletic Field
Hosp
Asa Wood Jr HS
4
Gravel Pit
Cem
3
Sewage Disposal
BM 2073
Flower
IDAHO
CALIFORNIA
Libby
Athletic Field
2099
Pioneer Park
CEDAR
ST
MINNESOTA
1 MILE
FOREST
9
10
9
10
2
Radio Tower (KLCB)
Golf
16
15
Libby

Libby-Larch Street.

Sources in Microinventory Area (1 mile radius)

Libby

Population = 3,300
VMT = 57,000

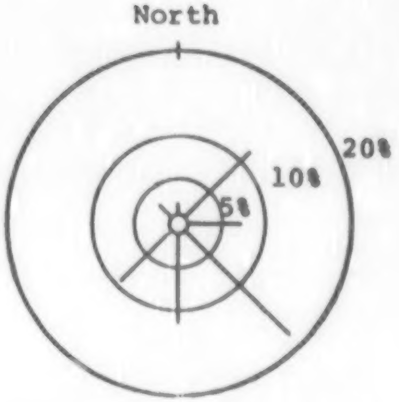
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 St. Regis Paper			370
Area sources:			
Fuel combustion	1 ton/200 pop		16
Other mobile	13 gal/capita	25 lb/1000 gal	1
Motor vehicle exhaust	57000 VMT/day	0.59 g/VMT	14
Fugitive dust sources:			
Unpaved roads	8.6 mi, 50 ADT	2.82 lb/VMT	221
Unpaved shoulders	21.6 mi	0.1 t/ac/yr	5
Paved roads	57000 VMT/day	3.5 g/VMT	80
Unpaved parking lots	36 ac	1.13 lb/VMT	17
Cleared areas	107 ac	0.10 t/ac/yr	10
RR right-of-way	5.4 ac	0.1 t/ac/yr	1
RR yards	26.4 ac	0.1 t/ac/yr	3
Playgrounds	11 ac	0.1 t/ac/yr	1
Total emissions, ton/yr			739
Emission density, ton/sq mi/yr			235
Percent fugitive dust			46

Meteorological Data

Average annual
wind speed = approximately 3 mph

Annual precipitation
1974)
1975) data not available
Normal)

No. of days
with precipitation = data not available



Libby - 28% calm (< 1 mph)

Maximum Recorded Concentrations

1974 = 227, second high = 218 ug/m^3 (based on limited data)
1975 = 196, second high = 161 ug/m^3

Summary and Conclusions

Only one year of continuous air quality data was found for the Libby site. The annual geometric mean in 1975 was 63 ug/m^3, well below the primary standard. With no recent sampling data indicating a violation of the standard, it would be difficult to document this AQCR as a non-attainment area.

The estimated emission density of 235 ton/sq mi/yr is sufficient to cause average concentrations above the standard, but half of this emission density is from a single point source almost a mile from the sampler. This point source would probably have a lesser effect on ambient concentrations than indicated by its portion of the emission density.

The other two sources (in addition to the point source) with a major effect on ambient concentrations are unpaved roads (30%) and paved streets (11%). The compliance status of the point source, St. Regis Paper, was not determined. If subsequent air quality data show that emission reductions are necessary, the reductions might be obtained by more stringent regulations for paper mills or by fugitive dust regulations. However, at present this site should be considered to have attained the standard.

The sampler does not appear to be particularly biased by localized sources, but it may be blocked from obtaining higher readings by a screen of tall pine trees (see photograph).

3.35 MAGNA-BROCKBANK JUNIOR HIGH SCHOOL
SAROAD Site No. 46-0520-001

Description

General site description - The sampler is located on the roof of the Brockbank Junior High School about 20 feet above ground level. It is in a residential neighborhood and set back from the street 75 feet.

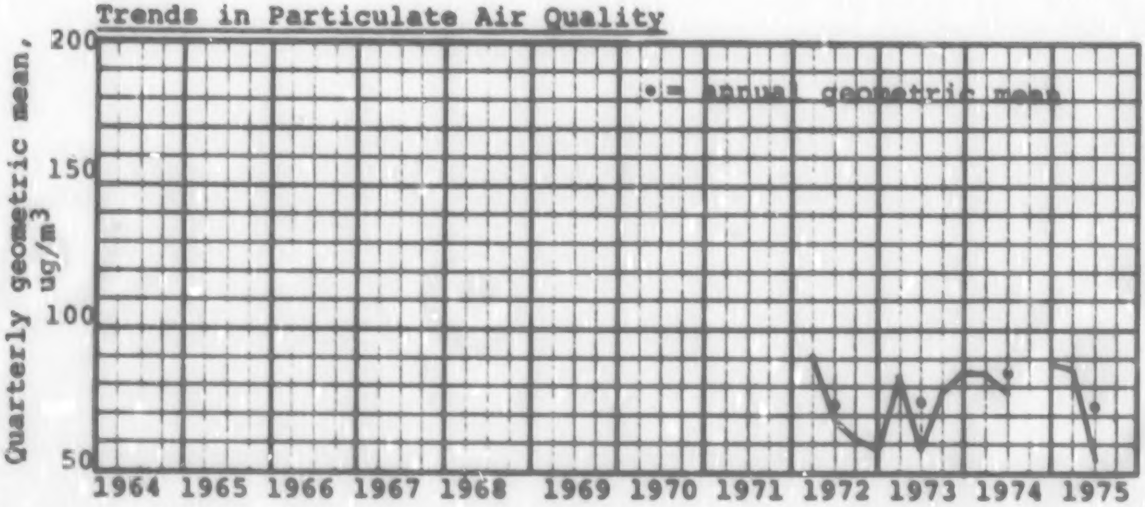
Localized pollution influences - The only unpaved area in the immediate vicinity which may impact the sampler is the athletic track 300 feet to the rear of the school. To the northwest about 5 miles lies the Kennecott Copper Smelter and to the northwest and north about 1 mile the tailings ponds.

Physical interferences - There are no obstructions or taller buildings in the vicinity of the sampler which may affect the readings.

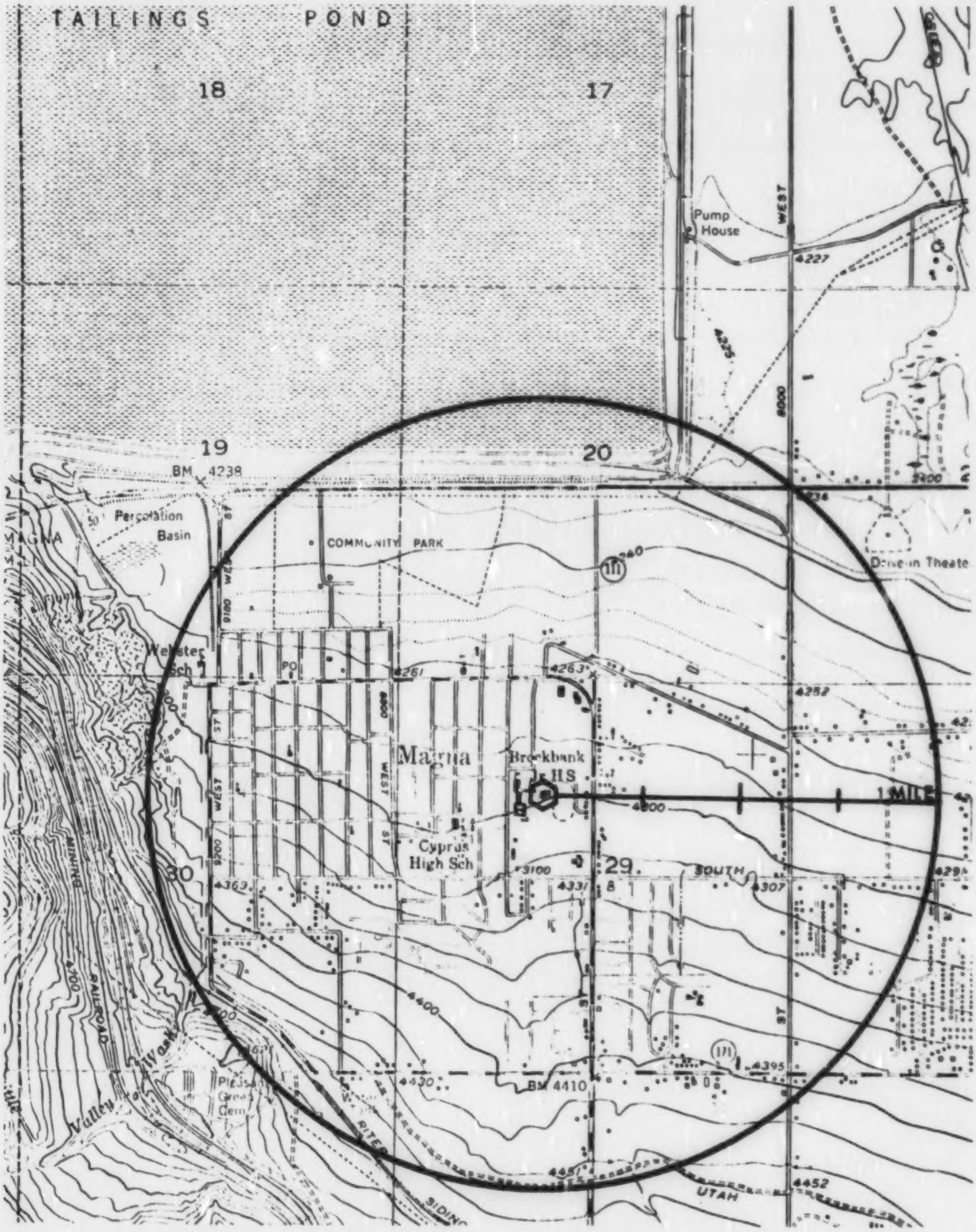
Terrain - The immediate area is flat. Beyond the 1 mile radius to the west, about 1.2 miles, the terrain rises in a steep gradient toward the smelter. The mean elevation of the survey area is 4,300 feet msl.

Comments - The sampler is well situated and probably provides a reasonably representative sampling of ambient air in Magna.

Trends in Particulate Air Quality



Magna sampler viewed to the west.


TAILINGS POND
18
17
19
20
29
30
BM 4238
Pump House
Percolation Basin
MAGNA
COMMUNITY PARK
Drive-in Theatre
Webster Sch
PO
Magna
Brockbank HS
Cypress High Sch
1 MILE
WEST
ST
SOUTH
MINING
RAILROAD
Valley
RITER
SIDING
UTAH
BM 4410
4227
4240
4261
4263
4252
4300
4307
4331
4369
4395
4430
4452
111
171

Magna-Brockbank Junior High School.

Sources in Microinventory Area (1 mile radius)

Population = 2,040
VMT = 32,000

Magna

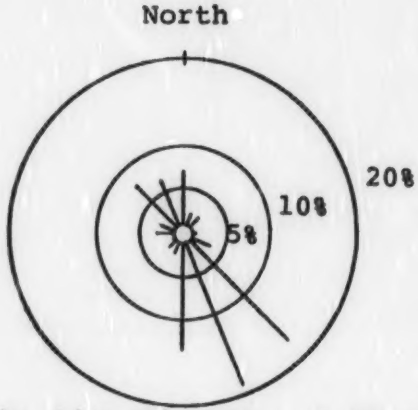
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Western Ready Mix			unknown
Kennecott Smelter	Outside mile radius		12020
Area sources:			
Fuel combustion Incineration Other mobile	From 1974 state emission inventory, 25.5% of total Magna emissions		18
Motor vehicle exhaust	32000 VMT/day	0.59 g/VMT	8
Fugitive dust sources:			
Unpaved roads	0.1 mi, 20 ADT	3.5 lb/VMT	1
Unpaved shoulders	7.7 mi	0.3 t/ac/yr	7
Paved roads	32000 VMT/day	3.5 g/VMT	45
Unpaved parking lots	5 ac	1.4 lb/VMT	3
Agriculture	95 ac	0.004 t/ac/yr	neg
Construction	14.7 ac, 4 mo	0.7 t/ac/mo	45
Cleared areas	3 ac	0.36 t/ac/yr	
RR right-of-way	4.6 ac	0.4 t/ac/yr	2
Tailings piles	40 ac in area	0.54 t/ac/yr	22
	(5580 ac outside mile radius)	(2.7 t/ac/yr @ 80% control)	3013
Total emissions, ton/yr			152
Emission density, ton/sq mi/yr			48
Percent fugitive dust			83

Meteorological Data

Average annual
wind speed = 8.7 mph

Annual precipitation
1974 = 14.46"
1975 = 17.92"
Normal = 15.17"

No. of days
with precipitation = 87



Salt Lake City Airport - 5.4% calm

Maximum Recorded Concentrations

1974 = 3080, second high = 460 ug/m^3
1975 = 1456, second high = 725 ug/m^3

Summary and Conclusions

The Magna site has been recording air quality measurements just slightly under the annual primary standard from 1972 to 1975, with the exception of 1974, when the geometric mean was 83 ug/m^3. The 1975 value was 69 ug/m^3, but this and the 1974 value was based on limited available data, and included unusually high maximum annual readings. Seasonal variations are not pronounced at this site. The microinventory showed that emissions from construction activities and tailings piles were the major contributors in the survey area. No point sources with probable impact on the sampler were identified within the one mile radius.

The calculated emission density of 48 ton/sq mi/yr does not support the measured 1975 concentration of 69 ug/m^3 and is much lower than normal for a non-attainment site. The site location appears to be free of physical obstructions or localized pollution influences which could adversely bias the sampler's readings. Thus, it would appear that two major sources outside the survey area, the Kennecott smelter and the major portion of the tailings piles (5580 acres) could, with a northwesterly wind, contribute to high particulate loadings measured at the sampler.

If a full year of sampling data shows the Magna site is still exceeding the primary standard, some emission reduction could probably be achieved by stringent enforcement of fugitive dust control regulations and ensuring the Kennecott smelter is operating under compliance.

3.36 OGDEN-COUNTY HEALTH DEPARTMENT
SAROAD Site No. 46-0680-001
OGDEN-NASN SAMPLING STATION
SAROAD Site No. 46-0680-001/P01

Description

General site description - The two samplers are located on the roof of the County Health Department in the commercial business district, about 15 feet above ground level.

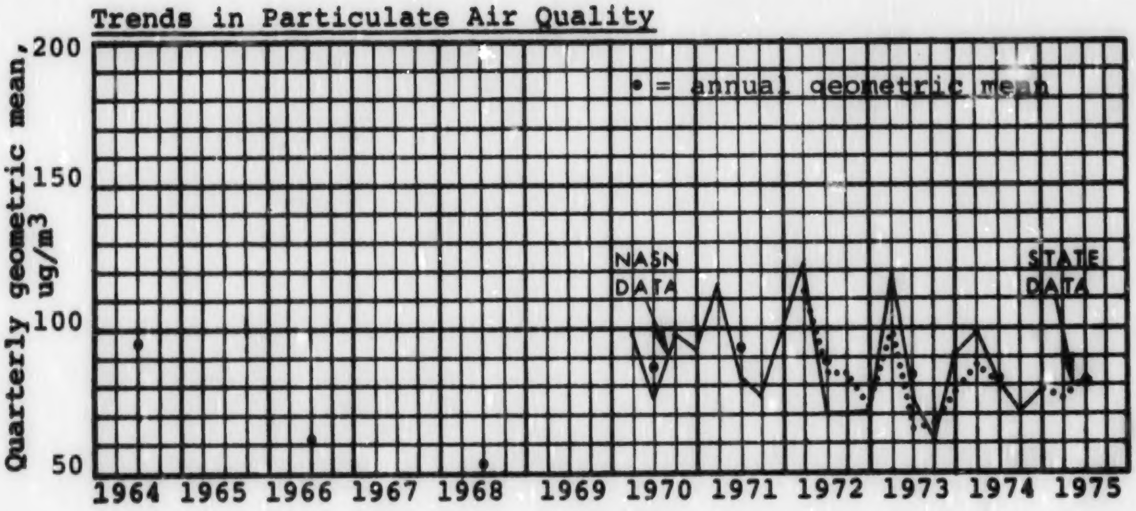
Localized pollution influences - The area in close proximity to the sampling site is generally clean and free of pollution bias. There are several vents and an incinerator stack on the roof close to the samplers.

Physical interferences - A stairway exit extends 6 feet above the roof and 10 feet behind the samplers. The fire station, 100 feet east of the samplers, is also higher.

Terrain - All the immediate and peripheral surrounding terrain is flat.

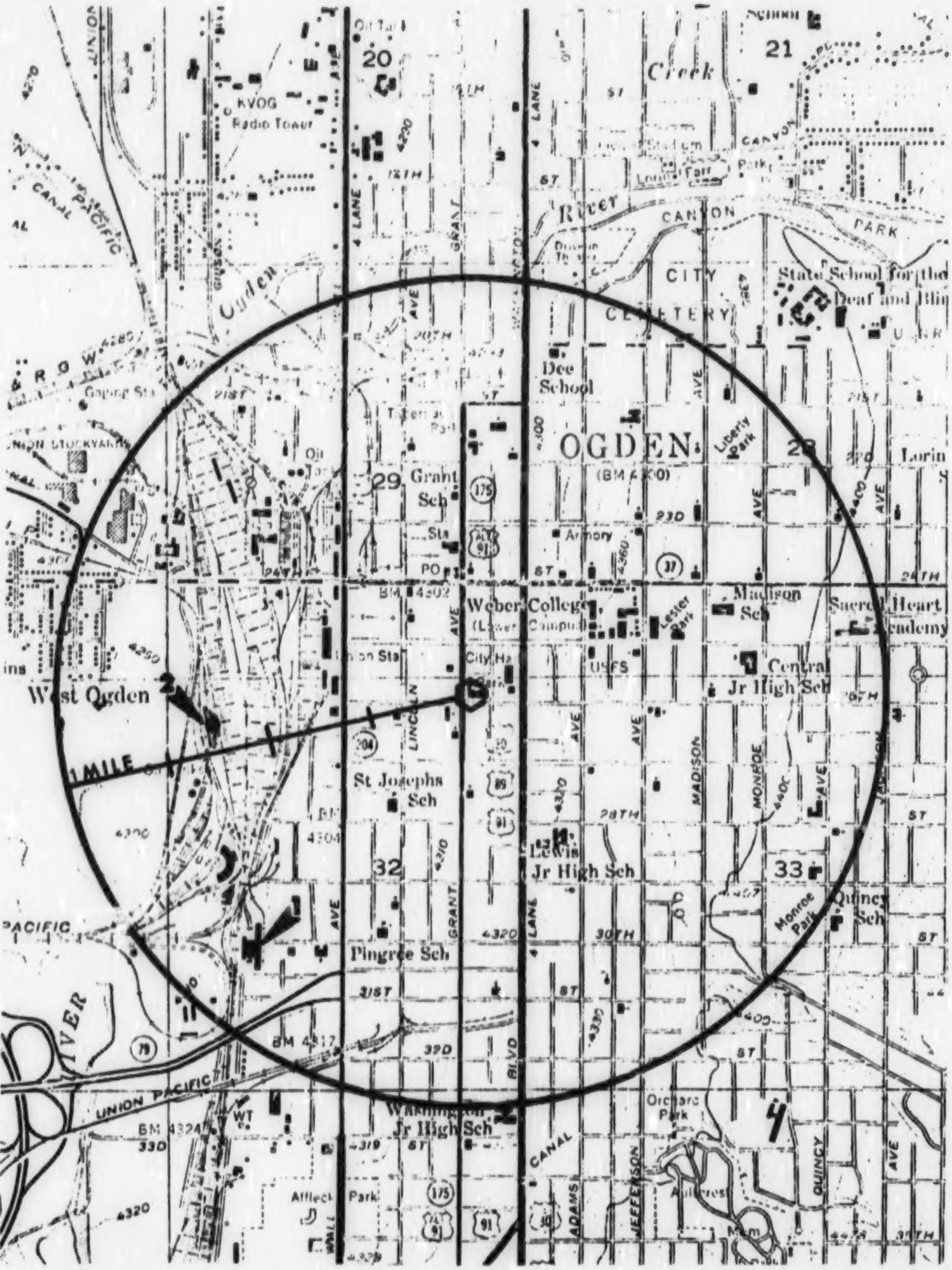
Comments - Downtown, in the areas surrounding the sampler site, the streets appeared to have coarse, sandy surfacing but were swept clean. Only the edges (shoulders) were dirty in the residential areas.

Trends in Particulate Air Quality



Ogden sampler viewed to the southwest.

Ogden sampler viewed to the northeast.


20
21
Creek
KVOG
Radio Tower
River
CANYON
PARK
Ogden
CITY
CEMETERY
State School for the Deaf and Blind
D R G W
Dee
School
OGDEN
(BM 4300)
Liberty Park
28
Grant Sch
29
Armory
Weber College
Madison Sch
Sacred Heart Academy
Lester Park
City Hall
Union Sta
Central Jr High Sch
West Ogden
1 MILE
St Josephs Sch
Lewis Jr High Sch
32
33
Quincy Sch
Monroe Park
Pingree Sch
RIVER
UNION PACIFIC
BM 4317
Washington Jr High Sch
Orchard Park
Affleck Park
CANAL
ADAMS
JEFFERSON
MADISON
MONROE
QUINCY
GRANT
LINCOLN
WALL
BLVD
4 LANE
24TH
25TH
28TH
30TH
31ST
33D

Ogden-County Health Department and Ogden-NASN Sampling Station.

Sources in Microinventory Area (1 mile radius)

Population = 2,040
Ogden-Health Department/NASN VMT = 172,000

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Fieldcrest Corporation			unknown
American Can			unknown
Farrell Elevator			8
Fife Rock Products	Outside mile radius		unknown
W. R. White	Outside mile radius		unknown
1 CM&E Elevator			76
2 Evans Elevator			25
Area sources:			
Fuel combustion	From 1974 state emission inventory, 2.9% of total Ogden emissions		20
Incineration			
Other mobile			
Motor vehicle exhaust	172000 VMT/day	0.59 g/VMT	41
Fugitive dust sources:			
Unpaved roads	0.9 mi, 30 ADT	3.5 lb/VMT	17
Unpaved shoulders	3.2 mi	0.1 t/ac/yr	1
Paved roads	172000 VMT/day	3.5 g/VMT	242
Unpaved parking lots	54 ac	1.4 lb/VMT	31
Construction	2 ac, 6 mo	0.7 t/ac/mo	9
Cleared areas	17 ac	0.1 t/ac/yr	2
RR right-of-way	31 ac	0.1 t/ac/yr	4
RR yards	280 ac	0.1 t/ac/yr	33
Playgrounds	2 ac	0.1 t/ac/yr	neg
Total emissions, ton/yr			509
Emission density, ton/sq mi/yr			162
Percent fugitive dust			67

Meteorological Data

No local data available.

Maximum Recorded Concentrations

1974 = 556, second high = 356 ug/m^3 (State)
231, second high = 185 ug/m^3 (NASN)
1975 = 437, second high = 345 ug/m^3 (State)
125, second high = 96 ug/m^3 (NASN)

Summary and Conclusions

The Ogden sites (State and NASN) have recorded annual geometric means over 80 ug/m^3 since 1970 with a slight downtrend since 1972. In all these years, the highest quarterly average has occurred in the first (winter) quarter, indicating a strong seasonal impact from a source such as road sanding. The 1975 State site annual geometric mean, based on two quarters of data, was 79 ug/m^3. Major impacting sources in the one mile radius area were identified to be two grain elevators, reentrained dust from paved roads, motor vehicle exhaust, unpaved parking lots, and railroad yards, which in the aggregate account for 88 percent of the emissions.

The samplers appear to be well located and free from localized pollution influences which could adversely affect the readings. However, the estimated emission density of 162 ton/sq mi/yr for the area surrounding the site does not appear sufficient to cause the annual average of around 80 ug/m^3 at the site. It is possible that sources external to the survey area are contributing significantly to the loadings.

Most of the source categories identified as contributing to the high readings at these sites appear to be further controllable (e.g., dust from paved roads, unpaved parking lots, railroad yards). All fugitive dust sources account for approximately 67 percent of the emissions in the survey area. If minor emission reductions would be necessary to attain the standards based on subsequent air quality data, they could best be achieved through an SIP revision to promulgate fugitive dust control regulations.

3.37 PROVO-COURTHOUSE
SAROAD Site No. 46-0800-001

Description

General site description - The sampler is located on the roof of the Courthouse (17 South University Avenue) in the commercial central business district of town. It is 50 feet above ground level.

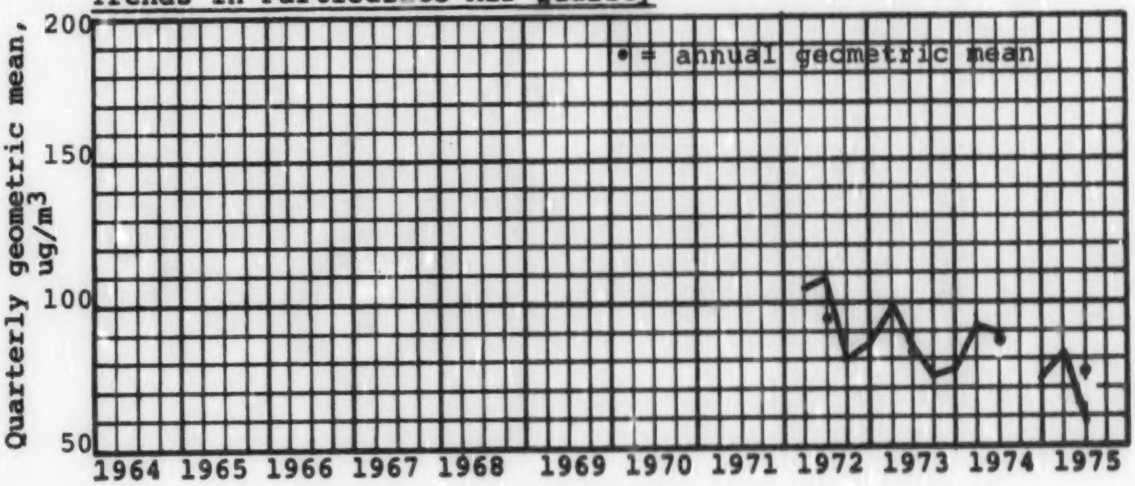
Localized pollution influences - There are no adverse sources of particulates which could bias the sampler's readings other than traffic.

Physical interferences - On the roof, a five foot wall surrounds the sampler and there are several other roof and building projections on the Courthouse.

Terrain - The immediate area around the sampler is flat. Just beyond the eastern perimeter of the 1 mile radius circle, the Wasatch Range mountains begin.

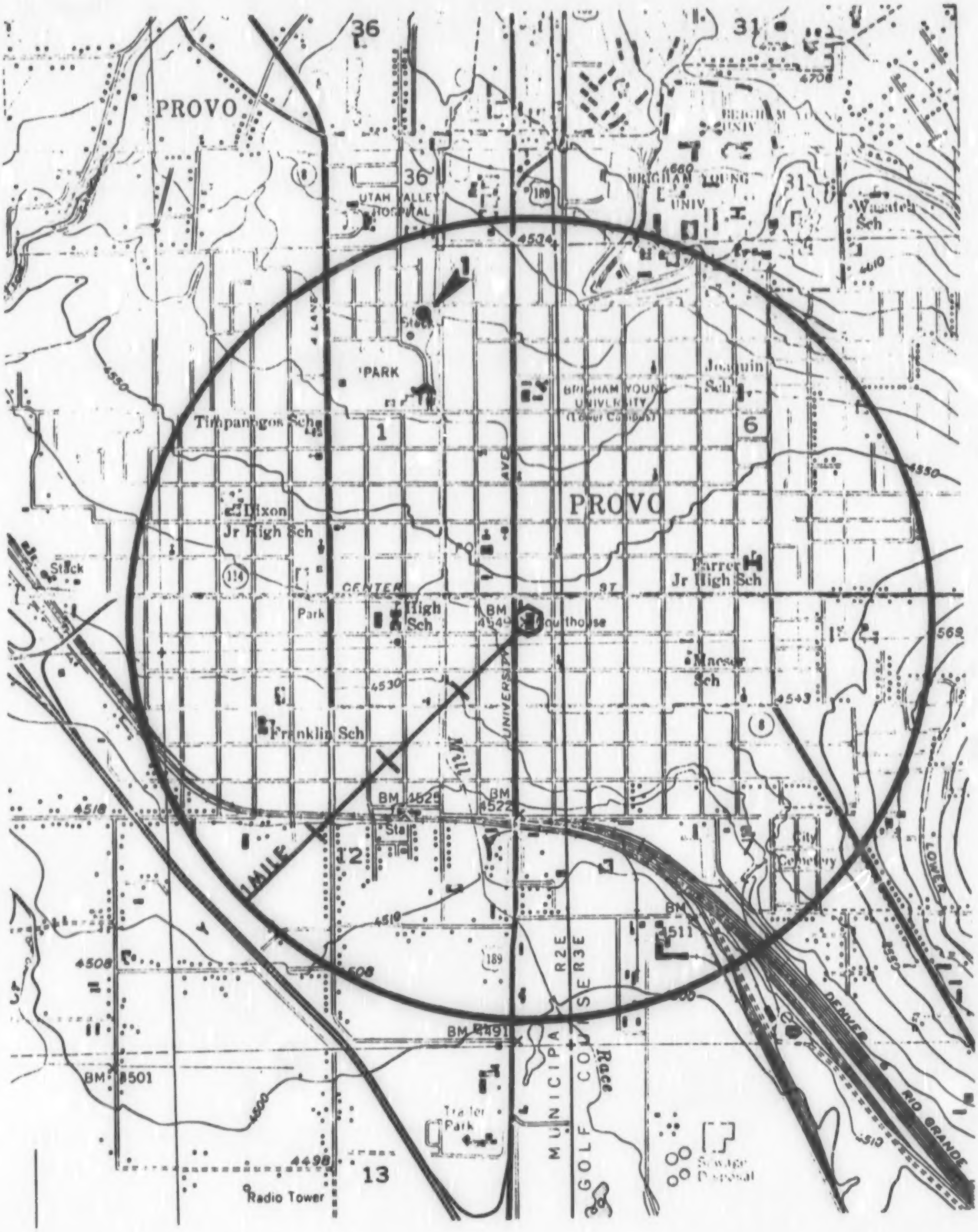
Comments - Overall, the town is not highly influenced by fugitive dust sources. The streets are clean and appear swept, and there is little agriculture. The sampler siting is adequate and its measurements probably are representative of the air quality in Provo.

Trends in Particulate Air Quality



View of Provo sampler.

Provo sampler--view to the east.


PROVO
36
31
UTAH VALLEY HOSPITAL
BRIGHAM YOUNG UNIV
Wasatch Sch
189
4534
Stack
PARK
Timpanogos Sch
BRIGHAM YOUNG UNIVERSITY (Lower Campus)
Joaquin Sch
1
6
PROVO
4550
Dixon Jr High Sch
114
Farrer Jr High Sch
CENTER ST
Park
High Sch
BM 4549
Courthouse
Maeser Sch
4530
4543
Franklin Sch
UNIVERSITY AVE
1 MILE
4518
BM 4525
BM 4522
Sta
12
City Cemetery
4510
BM 4511
4508
R2E
R3E
BM 4491
MUNICIPAL GOLF COURSE
Race
BM 4501
Trailer Park
Sewage Disposal
4498
13
Radio Tower
DENVER
RIO GRANDE
LOWER

Provo-Courthouse.

Sources in Microinventory Area (1 mile radius)

Provo

Population = 2,040
VMT = 187,500

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 Provo City Power			65
U.S. Steel	Outside mile radius		6557
Denver & Rio Grande Western Railroad maintenance shop	Outside mile radius		unknown
Area sources:			
Fuel combustion Incineration Other mobile	From 1974 state emission inventory, 3.8% of total Provo emissions		16
Motor vehicle exhaust	187500 VMT/day	0.59 g/VMT	44
Fugitive dust sources:			
Unpaved roads	0.6 mi, 20 ADT	3.5 lb/VMT	8
Unpaved shoulders	2.5 mi	0.2 t/ac/yr	1
Paved roads	187500 VMT/day	3.5 g/VMT	264
Unpaved parking lots	34 ac	1.4 lb/VMT	20
Agriculture	18 ac	0.004 t/ac/yr	neg
Construction	8 ac, 4 mo	0.7 t/ac/mo	24
Cleared areas	14 ac	0.1 t/ac/yr	3
RR right-of-way	20 ac	0.2 t/ac/yr	5
RR yards	39 ac	0.2 t/ac/yr	9
Playgrounds	1 ac	0.2 t/ac/yr	neg
Total emissions, ton/yr			459
Emission density, ton/sq mi/yr			146
Percent fugitive dust			73

Meteorological Data

No local data available.

Maximum Recorded Concentrations

1974 = 639 ug/m^3 (three quarters)
1975 = 226 ug/m^3 (two quarters)

Summary and Conclusions

The Provo site has recorded annual geometric means between 69 and 100 ug/m^3 since 1972. The trend has been toward a steady decrease in measured concentration since 1972, with the 1975 value at 69 ug/m^3. However, the 1974 and 1975 values were based on three and two quarters of data, respectively, lessening the statistical significance of those averages. The calculated emission density of 146 ton/sq mi/yr is somewhat low in comparison with the 1975 air quality data. The site has no obvious localized pollution sources biasing the measurements, although a roof parapet surrounding the sampler (see photographs) could interfere with normal air movements.

The microinventory indicated the major contributing sources at this site to be dust from paved roads (58%), Provo City Power Company (14%), and motor vehicle exhaust (10%), with secondary impacts from fugitive dust sources such as unpaved parking lots and construction (10%). It is a distinct possibility that the sampler could be reflecting an impact caused by the U.S. Steel facility to the north, as well as other point sources outside the survey area, thus accounting for the low emission density relative to air quality. Nevertheless, a positive determination of the attainment status of this site should be made at a future date when a full year of post-1974 air quality data can be analyzed. At that time, if an attainment problem is still indicated, regulations pertaining to the control of fugitive dust could be implemented to reduce emissions, since most of the problem source categories are further controllable.

3.38 SALT LAKE CITY-COUNTY HEALTH DEPARTMENT
SAROAD Site No. 46-0920-001
SALT LAKE CITY-NASN SAMPLING STATION
SAROAD Site No. 46-0920-001/P01

Description

General site description - The two samplers are located on the roof of the County Health Department (610 South Second, East) approximately 25 feet above ground level. The building is in an area of light commercial land use and surrounded by paved streets and parking lots.

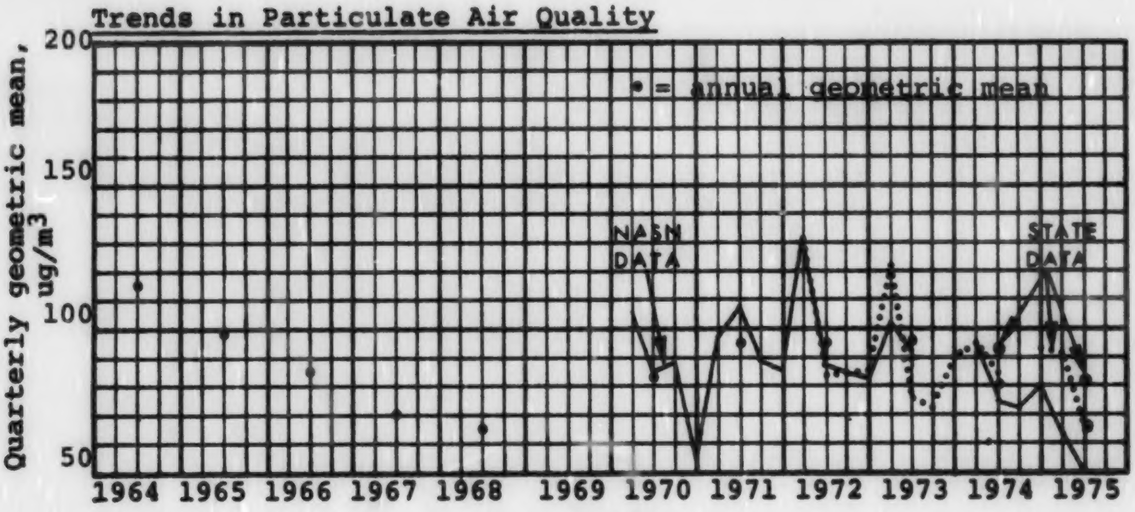
Localized pollution influences - The only source of significance that could impact the samplers is a construction equipment storage lot 50 feet to the south. Traffic is moderate in the area.

Physical interferences - There are no obstructions or taller buildings in the immediate vicinity which might affect the samplers' readings.

Terrain - The terrain in the vicinity of and throughout the 1 mile radius microinventory area is flat with no predominant features.

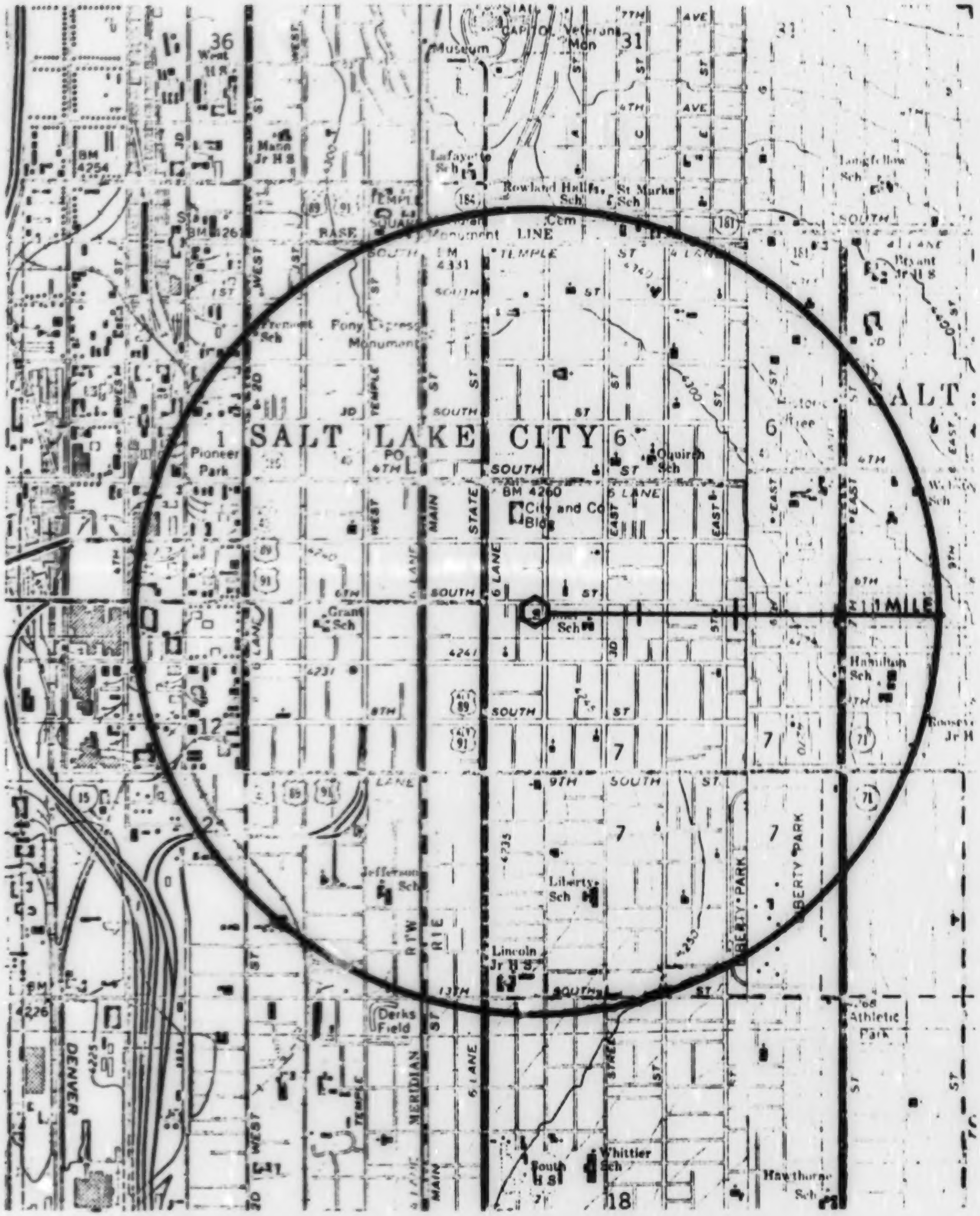
Comments - The samplers should be providing representative indications of air quality as they are situated well and have good urban exposure.

Trends in Particulate Air Quality



Salt Lake City-County Health Department sampler viewed to the west.

Salt Lake City-County Health Department sampler viewed to the east.


SALT LAKE CITY
SALT
1 MILE
Museum
Capitol
Veterans Mon
Mann Jr H S
Lafayette Sch
Rowland Hall Sch
St Marks Sch
Cem
Monument
BASE LINE
TEMPLE
Longfellow Sch
Bryant Jr H S
Fremont Sch
Pony Express Monument
Pioneer Park
PO
Ouirch Sch
BM 4260
City and Co Bldg
Grant Sch
Sch
Hamilton Sch
Roosevelt Jr H
Jefferson Sch
Liberty Sch
LIBERTY PARK
Lincoln Jr H S
Derks Field
Athletic Park
South H S
Whittier Sch
Hawthorne Sch
DENVER
MERIDIAN
R1W
R1E
MAIN
STATE
WEST
EAST
SOUTH
BM 4254
BM 4331
BM 4226
36
31
6
7
12
18
89
91
15
71
184
181

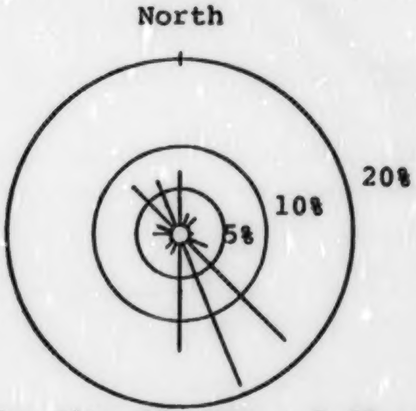
Salt Lake City-County Health Department and Salt Lake City-NASN Sampling Station.

Sources in Microinventory Area (1 mile radius)

Population = 2,040
Salt Lake City-Health Department/NASN VMT = 240,000

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
CM&E Elevator	Outside mile radius		43
Ideal Cement	Outside mile radius		unknown
Portland Cement	Outside mile radius		unknown
Area sources:			
Fuel combustion Incineration Other mobile	From 1974 state emission inventory, 1.2% of total Salt Lake City emissions		15
Motor vehicle exhaust	240000 VMT/day	0.59 g/VMT	57
Fugitive dust sources:			
Unpaved shoulders	1.7 mi	0.2 t/ac/yr	1
Paved roads	240000 VMT/day	3.5 g/VMT	338
Unpaved parking lots	7 ac	1.4 lb/VMT	4
Construction	8 ac, 4 mo	0.7 t/ac/mo	24
Cleared areas	20 ac	0.1 t/ac/yr	4
RR right-of-way	8 ac	0.2 t/ac/yr	2
RR yards	7 ac	0.2 t/ac/yr	2
Playgrounds	5 ac	0.2 t/ac/yr	1
Total emissions, ton/yr			448
Emission density, ton/sq mi/yr			143
Percent fugitive dust			74

Meteorological Data



Salt Lake City Airport - 5.4% calm

Average annual
  wind speed = 8.7 mph

Annual precipitation
    1974 = 14.46"
    1975 = 17.92"
  Normal = 15.17"

No. of days
  with precipitation = 87

Maximum Recorded Concentrations

1974 = 704, second high = 634 ug/m^3 (State)
       235, second high = 175 ug/m^3 (NASN)
1975 = 691, second high = 335 ug/m^3 (State)
       180, second high = 135 ug/m^3 (NASN)

Summary and Conclusions

The two Health Department sites have been recording concurrently since 1972 and have shown the annual geometric mean decreasing each year, although there has been limited available data for the sites since 1973. The 1974 NASN reading was 80 ug/m^3, and the 1975 value was 66 ug/m^3 (the average of the State and NASN means, since only two quarters of data were available for each). Seasonal variations in data from the two sites are directly comparable, with the winter quarter the highest. From 1964 to 1972, the NASN site indicated cyclical fluctuating annual averages, varying from 115 to 65 ug/m^3. The calculated emission density of 143 ton/sq mi/yr for the survey area appears too low to support the 1974 or 1975 air quality data.

The major sources identified as impacting the sampler are traffic related (motor vehicle exhaust and dust from paved roads--88 percent). Secondary fugitive dust sources do not appear to play a large role in this area, nor do point sources. Contributing to the measured air quality in the area may be impacts from outlying point sources in the industrial area to the west. Future non-attainment determinations based on post-1974 air quality data will be necessary before additional control strategies or needs can be assessed. If found necessary, an SIP revision incorporating improved street cleaning or traffic controls to reduce reentrained dust emissions from paved roads may be instituted.

3.39 SALT LAKE CITY-AIRPORT
SAROAD Site No. 46-0920-004

Description

General site description - The sampler is located on the roof of the National Weather Service (NWS) building at the airport (175 North and 2400 West) about 15 feet above ground level. It is totally surrounded by public use land in a rather sparsely populated area of the city. There are paved parking lots on three sides of the NWS building.

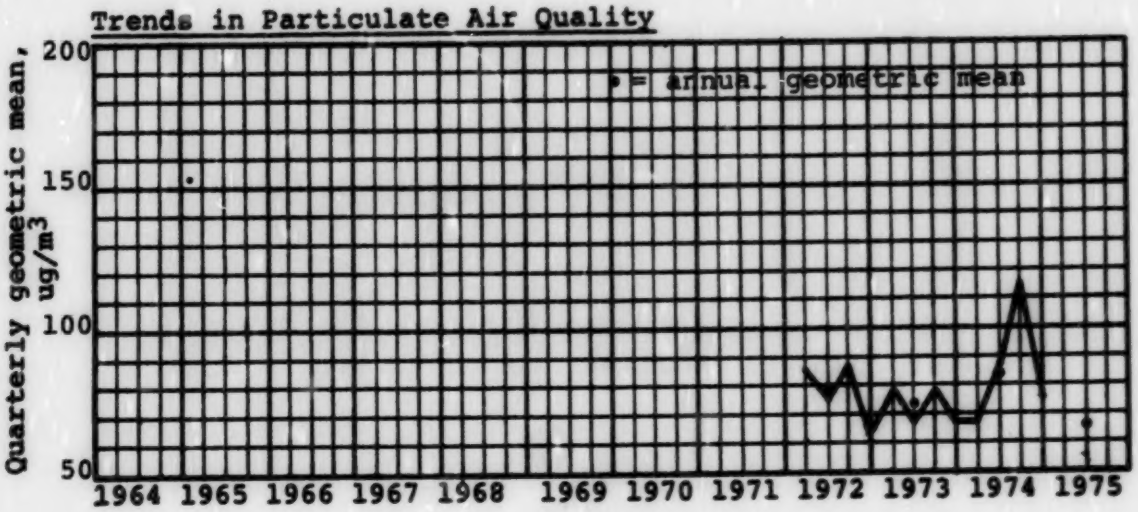
Localized pollution influences - There are an incinerator and a heating stack on the roof 20 feet from the sampler. The predominant secondary influences in the vicinity would be traffic and aircraft.

Physical interferences - With the exception of one small air conditioning compressor 10 feet from the sampler, there are no obstructions or tall buildings which would impede its performance.

Terrain - The immediate vicinity and surrounding areas out to the edge of the 1 mile radius are flat. The Great Salt Lake begins about 10 miles northwest.

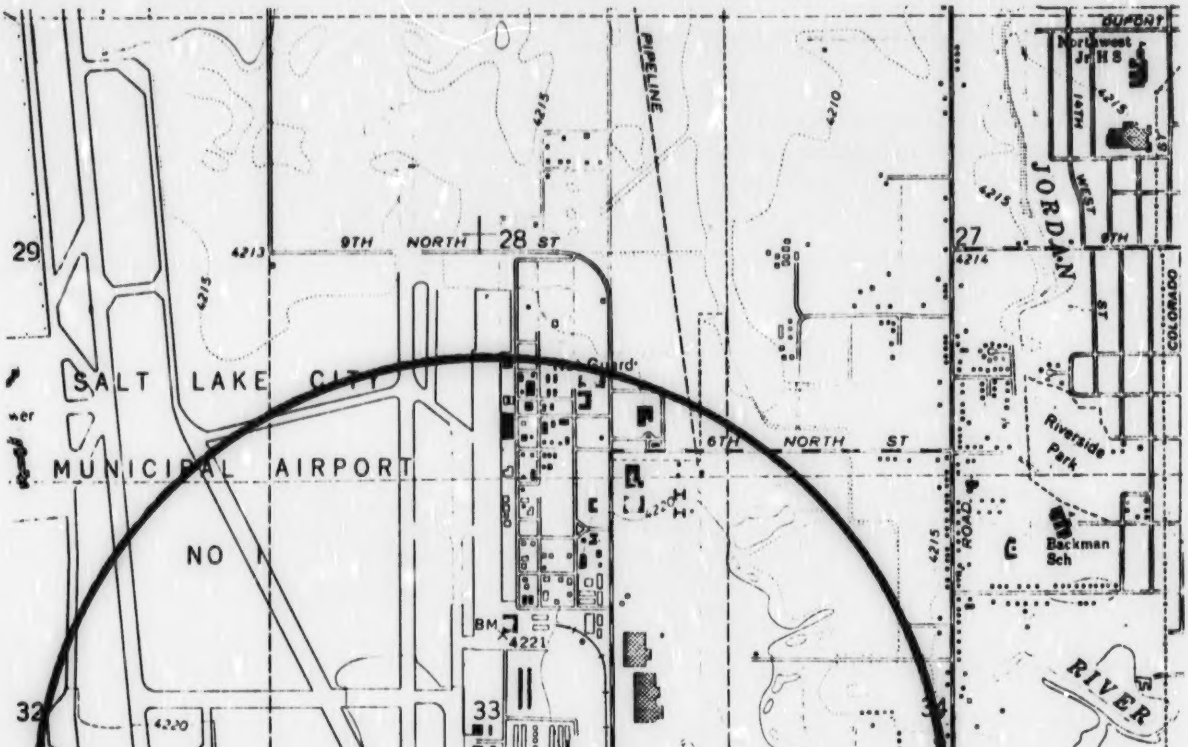
Comments - The measured particulate concentrations at this site are probably representative of the air quality at the airport, since the site is almost entirely influenced by aircraft-related sources. However, the traffic on North Temple Street may possibly have a significant impact on the sampler's readings.

Trends in Particulate Air Quality



Salt Lake City-Airport sampler viewed to the east.

Salt Lake City-Airport sampler viewed to the west-northwest.


SALT LAKE CITY
MUNICIPAL AIRPORT
NO
9TH NORTH 28 ST
6TH NORTH ST
NORTH TEMPLE ST
4 LANE
BASE AND LINE
GARFIELD
WESTERN
BRIGHTON
CANAL
CITY
2D SOUTH ST
PACIFIC
5TH SOUTH ST
DRAIN
REDWOOD ROAD
JORDAN
RIVER
Riverside Park
Backman Sch
Northwest Jr H S
Substation
Sherwood Park
PIPELINE
1 MILE
BM 4221
BM 4228
BM 4230
29
32
33
28
27
5
4
3
68
80
4213
4215
4210
4214
4220
4222
4225
4230

Salt Lake City-Airport.

Sources in Microinventory Area (1 mile radius)

Salt Lake City-Airport
Population = 314
VMT = 73,500

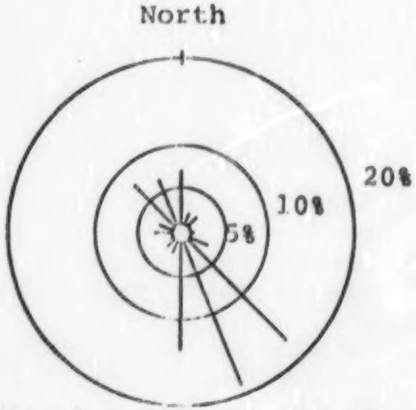
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Utah Power & Light	Outside mile radius		396
Area sources:			
Fuel combustion Incineration Other mobile	From 1974 state emission inventory, 0.2% of total Salt Lake City emissions		3
Motor vehicle exhaust	73500 VMT/day	0.59 g/VMT	17
Fugitive dust sources:			
Unpaved roads	2.0 mi, 20 ADT	3.5 t/ac/yr	26
Unpaved shoulders	4.5 mi	0.2 t/ac/yr	2
Paved roads	73500 VMT/day	3.5 g/VMT	104
Unpaved parking lots	5 ac	1.4 lb/VMT	3
Construction	22 ac, 4 mo	0.7 t/ac/mo	67
Cleared areas	110 ac	0.1 t/ac/yr	21
RR right-of-way	15 ac	0.2 t/ac/yr	4
Total emissions, ton/yr			247
Emission density, ton/sq mi/yr			79
Percent fugitive dust			92

Meteorological Data

Average annual
wind speed = 8.7 mph

Annual precipitation
1974 = 14.46"
1975 = 17.92"
Normal = 15.17"

No. of days
with precipitation = 87



Salt Lake City Airport - 5.4% calm

Maximum Recorded Concentrations

1974 = 827, second high 508 ug/m^3
1975 = 239, second high 225 ug/m^3

Summary and Conclusions

The Airport sampler has been recording annual geometric means in excess of 70 ug/m^3 since 1972, with the exception of 1975, when the reading was 66 ug/m^3. The seasonal variations have fluctuated during that period and no distinct trends are evident. The sampler does not appear to be unduly influenced by localized pollution influences.

The calculated emission density of 79 ton/sq mi/yr is mostly (92%) composed of impacts from fugitive dust sources, specifically dust from paved and unpaved roads and construction. This value correlates well with the 1975 air quality data (which is incomplete) but is much too low to be in agreement with the 1974 value (84 ug/m^3).

Based on a 1974 base year, it is indicated that an SIP revision to include measures for fugitive dust control is warranted for this site.

3.40 ROCK SPRINGS-BRIDGER AVENUE
SAROAD Site No. 52-0620-001

Description

General site description - The sampler is located on the roof of a garage at a private residence (416 Bridger Avenue) placed approximately 12 feet above ground level. It is set back from Bridger Avenue about 75 feet to the south.

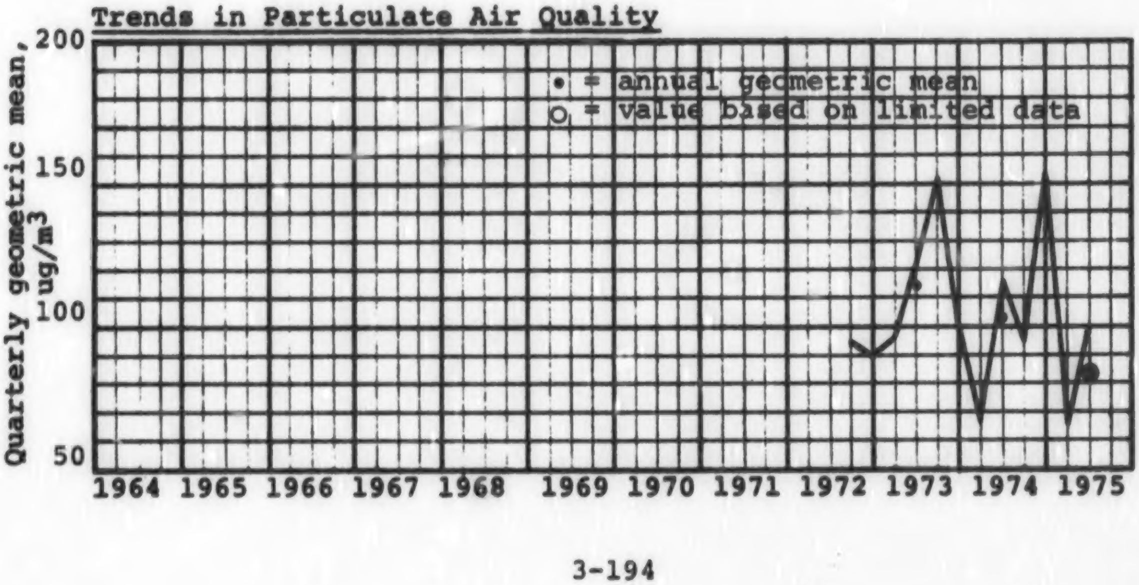
Localized pollution influences - Unpaved driveways exist on both sides of the garage and there are numerous roof vents on the closely spaced surrounding houses. The Rainbow Coal Company is located about 250 feet to the west.

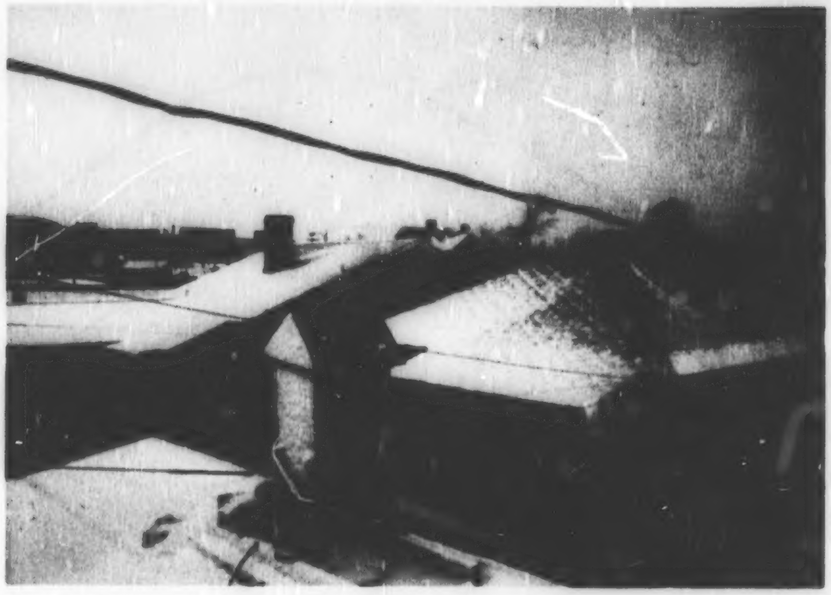
Physical interferences - There are no obvious obstructions in the close vicinity. One story houses surround the sampling site.

Terrain - The immediate area around the sampler is flat, while the terrain is hilly in the north and west quadrants of the 1 mile radius survey area.

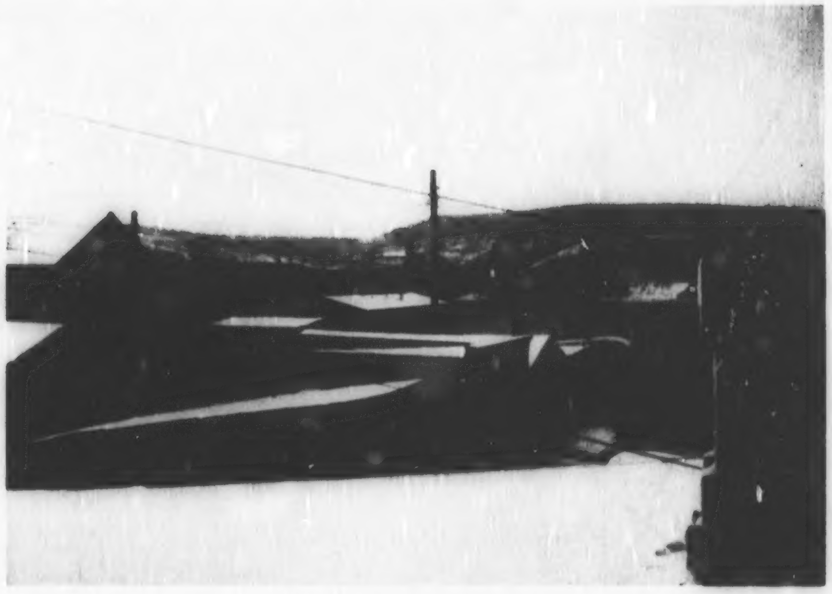
Comments - Overall, all the streets in town are very dirty and unswept. There are a lot of new developments and associated open construction sites and a lot of cleared open areas. The sampler is probably yielding representative readings of the air quality.

Trends in Particulate Air Quality

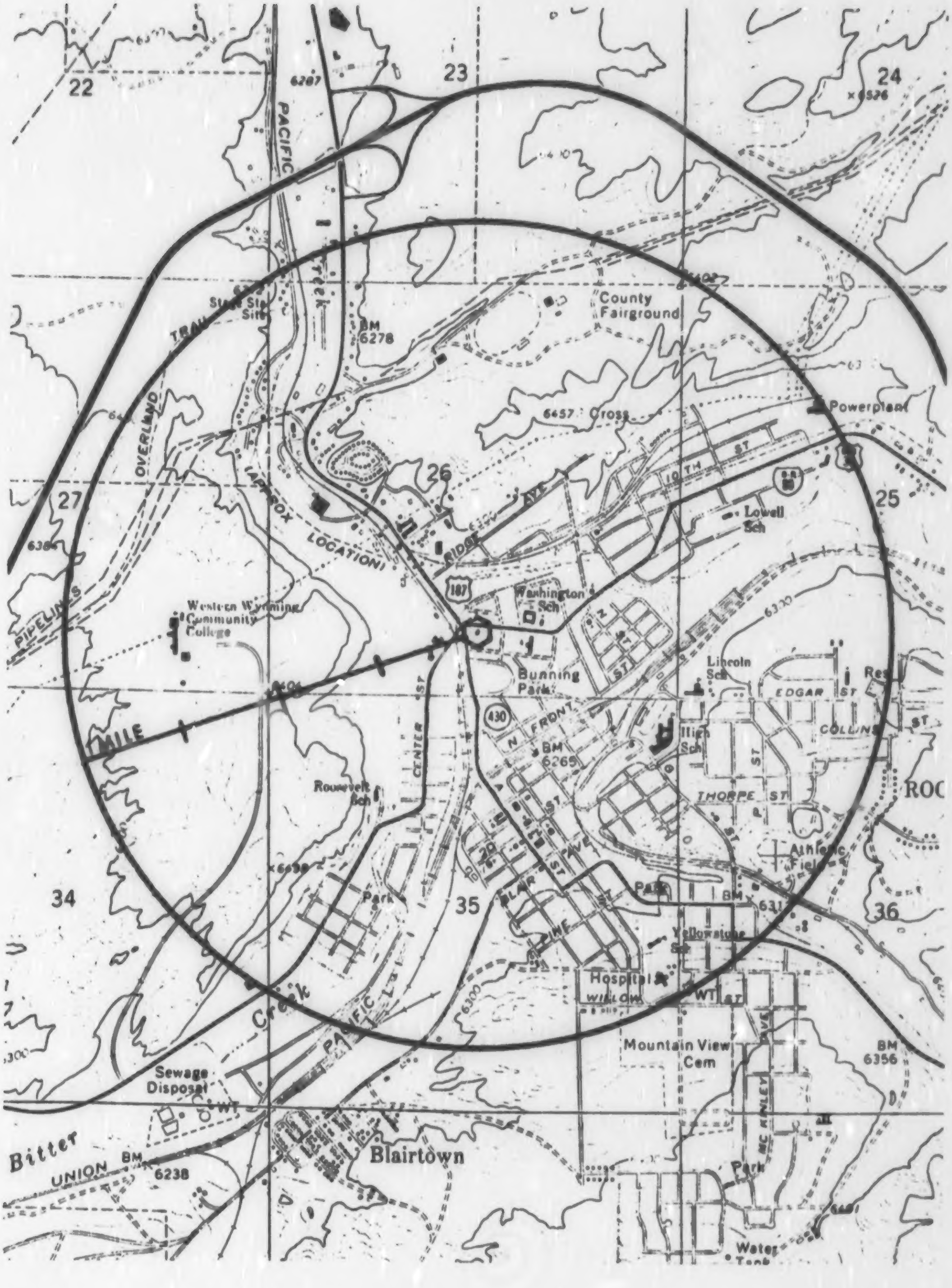




Rock Springs sampler viewed to the northwest.



Rock Springs sampler viewed to the west.


22
23
24
25
26
27
34
35
36
PACIFIC
Creek
Stage Sta Site
OVERLAND TRAIL
PIPELINES
(APPROX LOCATION)
BM 6278
County Fairground
Cross
Powerplant
10TH ST
RIDGE AVE
Lowell Sch
Washington Sch
Western Wyoming Community College
Bunning Park
Lincoln Sch
EDGAR ST
COLLINS ST
N FRONT
BM 6265
High Sch
THORPE ST
ROC
Athletic Field
Roosevelt Sch
CENTER ST
Park
BLAIR
PINE
Yellowstone Sch
Hospital
WILLOW
Mountain View Cem
BM 6356
Sewage Disposal
Bitter
UNION
BM 6238
Blairtown
MC KINLEY AVE
Water Tank
1 MILE
187
430

Rock Springs-Bridger Avenue.

Sources in Microinventory Area (1 mile radius)

Rock Springs

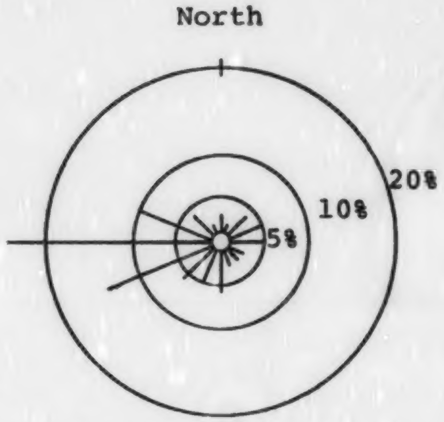
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
Rainbow Coal			unknown
Constantino Building			unknown
Mountain Fuel Supply			unknown
Area sources:			
Fuel combustion	From AQMA analysis, emissions in grids 2, 3, 25% of 4, and 60% of 5		49
Highway vehicles			25
Railroads			1
Fugitive dust sources:			
Unpaved roads	6.1 mi, 80 ADT (shown as 314 ton in AQMA analysis)	3.3 lb/VMT	294
Unpaved shoulders	From AQMA analysis		18
Paved roads	77700 VMT/day (shown as 487 ton in AQMA analysis)	3.5 g/VMT	110
Road sanding	From AQMA analysis		110
Unpaved parking lots	30 ac	1.3 lb/VMT	16
Construction	39 ac 4 mo (shown as 140 ton in AQMA analysis)	1.06 t/ac/mo	165
Cleared areas	73 ac	0.36 t/ac/yr	27
RR right-of-way	42 ac	0.4 t/ac/yr	18
RR yards	20 ac	0.4 t/ac/yr	9
Playgrounds	5 ac	0.38 t/ac/yr	2
Total emissions, ton/yr			844
Emission density, ton/sq mi/yr			269
Percent fugitive dust			91

Meteorological Data

Average annual
  wind speed = 7.0 mph

Annual precipitation
    1974 = 4.54"
    1975 = 8.97"
  Normal = 8.79"

No. of days
  with precipitation = data not available



Rock Springs Airport

Maximum Recorded Concentrations

1974 = 347, second high = 308 ug/m^3
1975 = 231, second high = 207 ug/m^3

Summary and Conclusions

This Rock Springs site has been in operation since mid-1972 and has had readings consistently above the primary standard. The site has not yet shown any regular seasonal variations, but has had large quarter-to-quarter variations. The sampler appears to be well located and free from local biases. Another sampler placed in Rock Springs more recently has recorded similar concentrations well above the standard, indicating that the non-attainment problem in the city is widespread.

The estimated emission density is 269 ton/sq mi/yr, a value which supports the recent measured ambient concentration of 83 ug/m^3. Most of the emissions (91%) are from fugitive dust source categories, primarily unpaved roads, paved roads and sanding, and construction. Emission estimates made from the microinventory survey in general agreed closely with emissions estimated in the AQMA analysis for Rock Springs for corresponding areas.

It appears that attainment of the standard will require regulations to reduce emissions from some or all of the above fugitive dust source categories. Control techniques are available to obtain a low percent emission reduction for these types of sources.

3.41 RAPID CITY-PENNINGTON COUNTY HEALTH DEPARTMENT
SAROAD Site No. 43-1380-001

Description

General site description - The sampler is located on the roof of the Pennington County Health Department building (615 Kansas City Street) about 25 feet above ground level. The immediate site area is the core of the central business district, and is two blocks south of Main Street.

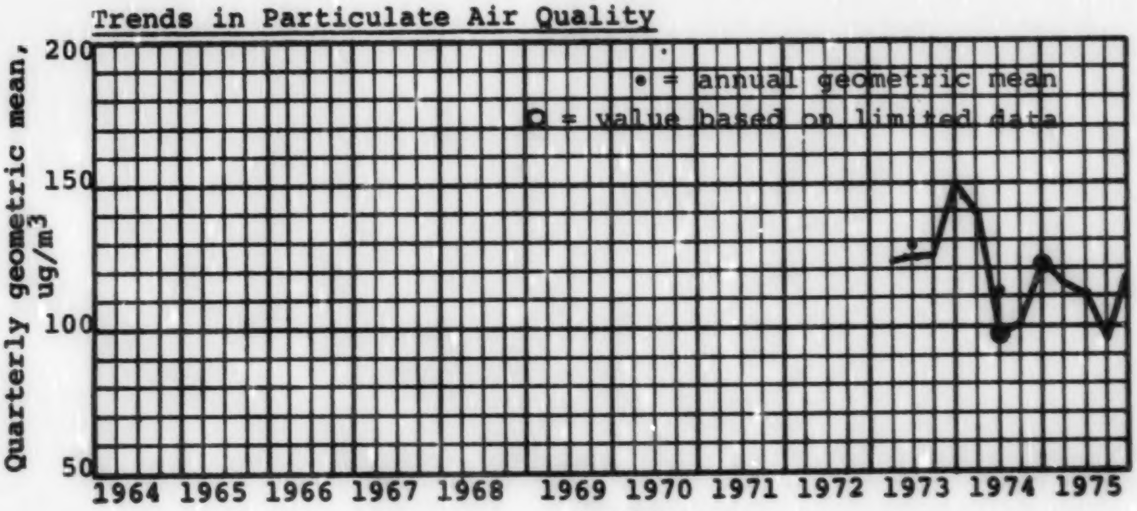
Localized pollution influences - The impact from traffic constitutes the only localized source which may be measured by the sampler. There are no localized fugitive dust influences in proximity to the site.

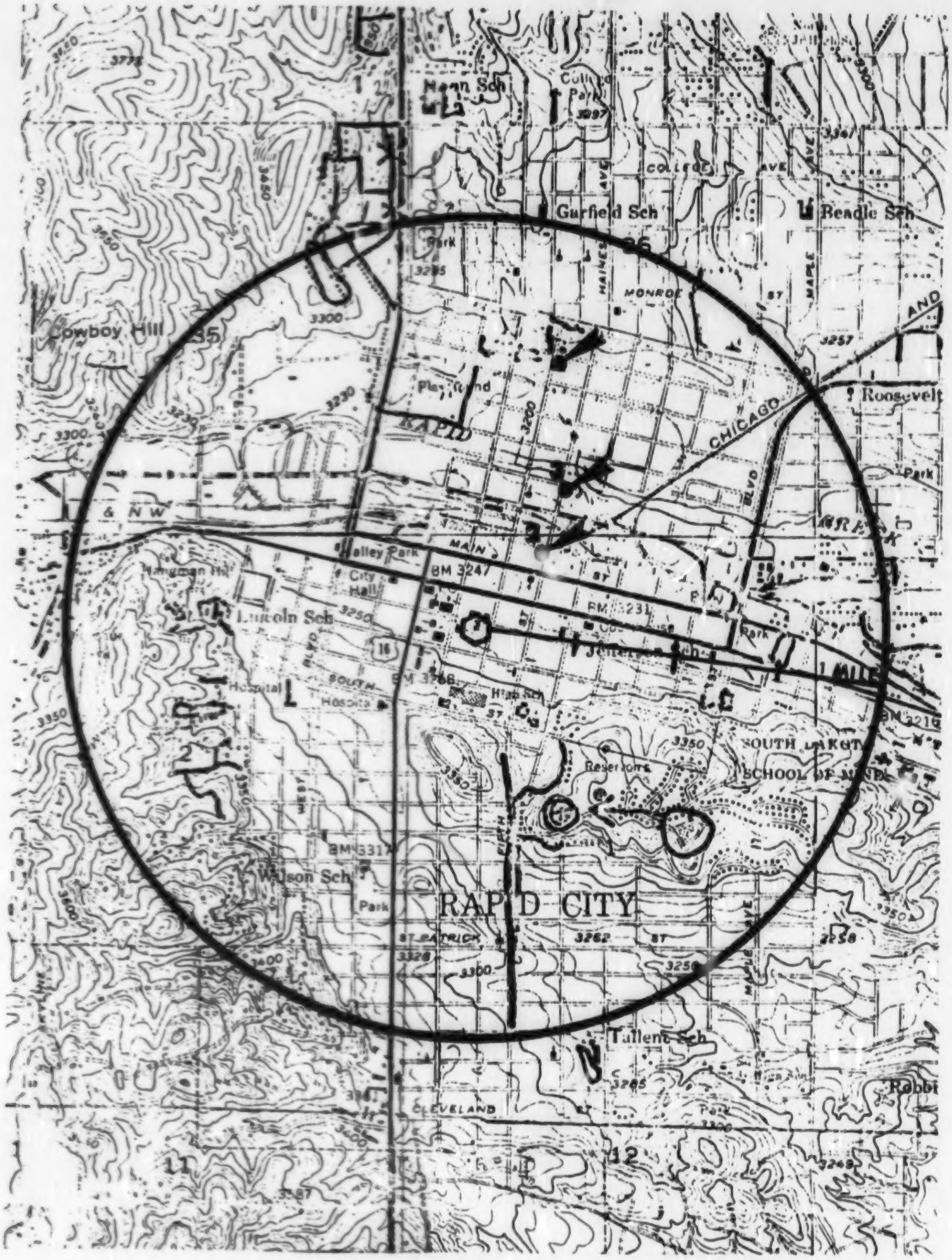
Physical interferences - The sampler is relatively removed from obstructions on the building and from surrounding taller buildings which could affect the readings or otherwise obstruct the ambient airflow patterns.

Terrain - The immediate site area is flat, but the periphery of the 1 mile radius study area is composed of steep ridges and semi-mountainous terrain. The steep north-south ridge which is due west of the sampler effectively bisects the city into two distinct aisheds--an eastern section and a western section.

Comments - In all probability, the particulate concentrations measured by this sampler are representative of the ambient air quality in the Rapid City urban area. The sampler is sited well and appears to be free from localized external source biases.

Trends in Particulate Air Quality




Mann Sch
College Park
COLLEGE AVE
Garfield Sch
Beadle Sch
HAINES AVE
MONROE
MAPLE
Cowboy Hill
35
36
Playground
RAPID
CHICAGO
AND
Roosevelt
Park
& NW
CREEK
Valley Park
MAIN ST
BM 3247
City Hall
BM 3231
Hangman Hill
Lincoln Sch
Jefferson Sch
16
Hospital
SOUTH ST
BM 3268
High Sch
1 MILE
Reservoirs
SOUTH DAKOTA SCHOOL OF MINES
BM 3317
Wilson Sch
Park
RAPID CITY
ST PATRICK ST
Tallent Sch
CLEVELAND
11
12

Rapid City-Pennington County Health Department.

Sources in Microinventory Area (1 mile radius)

Rapid City-Pennington County Health Department

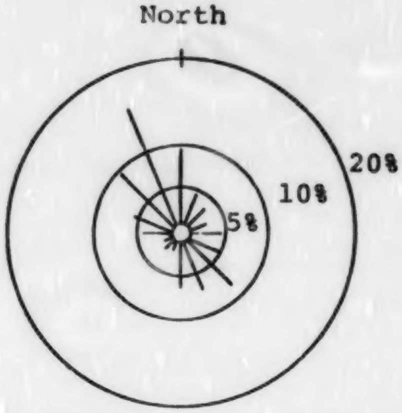
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 Light Aggregates			306
Hill's Materials			11
Birdsall Sand & Gravel			8
2 Aby's Feed & Seed			2
3 Hubbard Milling			33
Area sources:			
Fuel combustion	From AQMA analysis, apportioned from emission estimates by grid		18
Incineration			5
All mobile sources			9
Fugitive dust sources:			
Unpaved roads	7.3 mi, 21 ADT	4.0 lb/VMT	112
Unpaved shoulders	1.3 mi, 3.2 ac	0.3 t/ac/yr	1
Paved roads	25800 VMT/day	0.04 lb/VMT	188
Unpaved parking lots	4 ac	0.29 t/ac/yr	1
Construction	11 ac	6.4 t/ac/mo	70
Cleared areas	0.5 ac	0.26 t/ac/yr	neg
RR right-of-way	4.2 mi, 20.4 ac	0.3 t/ac/yr	6
RR yards	15 ac	0.3 t/ac/yr	4
Playgrounds	16 ac	0.26 t/ac/yr	4
Total emissions, ton/yr			778
Emission density, ton/sq mi/yr			248
Percent fugitive dust			50

Meteorological Data

Average annual
wind speed = 11.0 mph

Annual precipitation
1974 = 9.12"
1975 = 17.46"
Normal = 17.12"

No. of days
with precipitation = 100



Rapid City Airport - 5.2% calm

Maximum Recorded Concentrations

1974 = 242 ug/m^3; 1975 = 473 ug/m^3

Summary and Conclusions

The Health Department site has recorded annual mean concentrations above 100 ug/m^3 for all three years since it was established. The readings have exhibited consistent seasonal variations, with the highest concentrations in the fourth (fall) quarter. In contrast to the other sampling sites in the Rapid City area, this one seems to be well located and not unduly influenced by nearby sources.

The estimated emission density within a one mile radius was 248 ton/sq mi/yr, slightly lower than would be expected for an ambient concentration of 110 ug/m^3. The unusual topography and meteorology in the Rapid City area can explain the high measured concentrations. Contributing sources included at least five point sources which accounted for 46 percent of the identified emissions, plus several fugitive dust source categories--paved streets (24%), unpaved roads (14%), and construction (9%). It is probable that both further point source controls and fugitive dust regulations will be required, in the form of an SIP revision, in order to attain the primary standards at this site. New point source regulations should be directed at the mineral products industry.

3.42 RAPID CITY-KEN FREIZE ENTERPRISES
SAROAD Site No. 43-1380-003

Description

General site description - The sampler is located on the roof of a commercial building (Ken Freize Enterprises, 5001 Sturgis Road). It is approximately 15 feet above ground level and set back from Sturgis Road about 50 feet. The area is primarily industrial, just beyond the fringes of the commercial district.

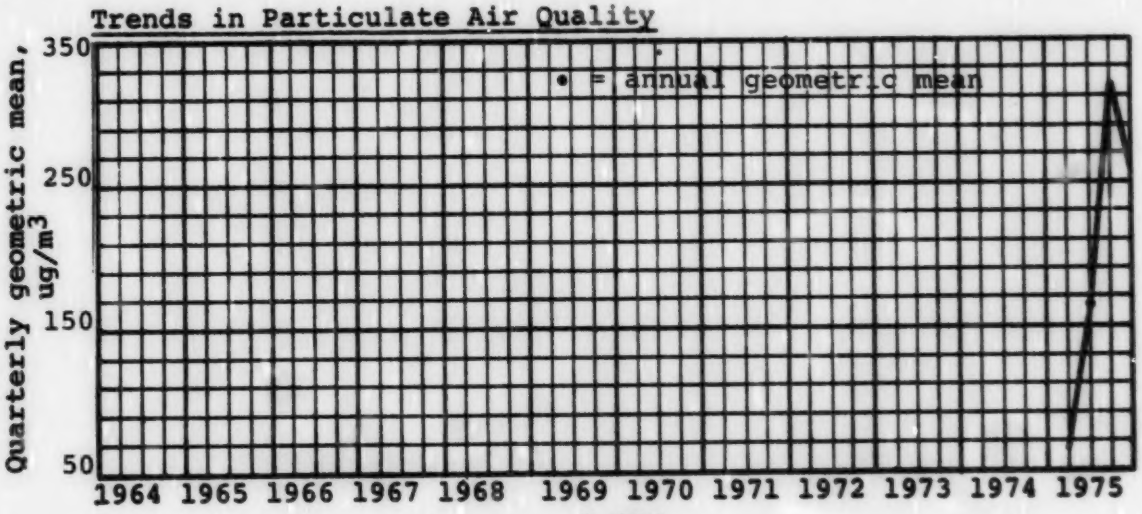
Localized pollution influences - A large (about one acre) unpaved parking lot surrounds the sampler on all four sides. An unpaved road passes on the northwest side of the building about 100 feet from the sampler. Directly across the highway to the northeast, Hill's Materials Company operates a large quarrying, sand and gravel, and limestone crushing operation.

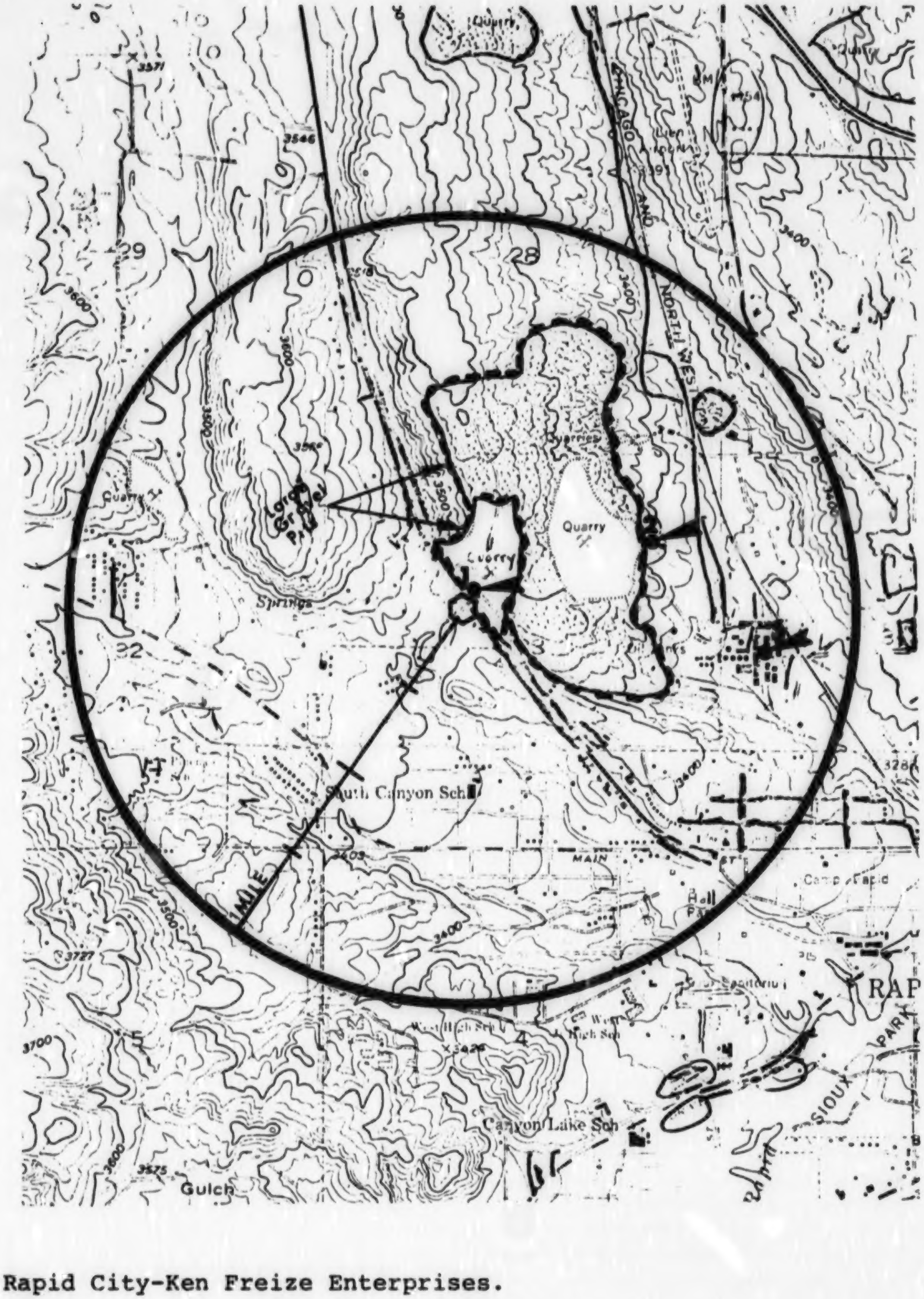
Physical interferences - No major obstructions were noted in the immediate vicinity of the sampler.

Terrain - The immediate site area is flat, but the remainder of the area enclosed by the 1 mile radius is characterized by rolling and hilly land. Several main highways pass through the area, including Sturgis Road, which passes through a shallow valley to the northwest of the sampler.

Comments - Due to its extreme source oriented exposure with respect to the localized fugitive influences and the proximity to Hill's Materials Company, the sampler is probably not recording representative readings of the ambient air in Rapid City.

Trends in Particulate Air Quality



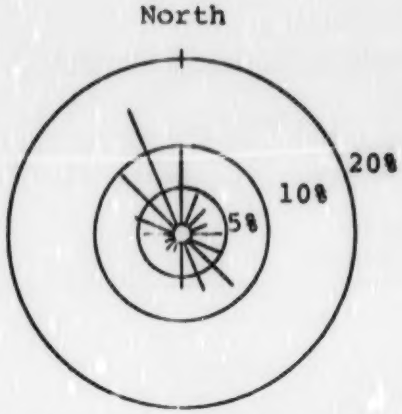

Quarry
Quarry
Quarry
Quarry
Quarry
Larcon Gravel Pit
Springs
South Canyon Sch
MAIN
Camp Rapid
RAP
West High Sch
Canyon Lake Sch
Gulch
CHICAGO AND NORTH WESTERN
1 MILE
28
29
32
4
5
3571
3546
3600
3500
3400
3405
3727
3700
3575
3426
3286

Rapid City-Ken Freize Enterprises.

Sources in Microinventory Area (1 mile radius)

Rapid City-Ken Freize Enterprises

Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 Hill's Materials			132
2 Pete Lien & Sons			2130
3 South Dakota Cement			221
Dakota Block			2
Area sources:			
Fuel combustion	From AQMA analysis, apportioned from emission estimates by grid		5
Incineration			1
All mobile sources			5
Fugitive dust sources:			
Unpaved roads	8.7 mi, 21 ADT	4.0 lb/VMT	133
Unpaved shoulders	1.7 mi, 4.1 ac	0.3 t/ac/yr	1
Paved roads	12900 VMT/day	0.04 lb/VMT	94
Road sanding	12900 VMT/day	0.003 lb/VMT	7
Unpaved parking lots	5 ac	0.29 t/ac/yr	1
Cleared areas	4 ac	0.26 t/ac/yr	1
RR right-of-way	2.6 mi 12.6 ac	0.3 t/ac/yr	4
Gravel pits/quarries	240 ac	9.4 t/ac/yr	2256
Total emissions, ton/yr			4993
Emission density, ton/sq mi/yr			1590
Percent fugitive dust			50



Rapid City Airport - 5.2% calm

Meteorological Data

Average annual
wind speed = 11.0 mph

Annual precipitation
1974 = 9.12"
1975 = 17.46"
Normal = 17.12"

No. of days
with precipitation = 100

Maximum Recorded Concentrations

1975 = 1507 ug/m^3

Summary and Conclusions

This site was installed in early 1975 and registered an annual geometric mean of 166 ug/m^3 for that year. The site inspection revealed that the sampler is located in the middle of a large unpaved lot directly across the highway from a large open pit quarry. These nearby sources probably overshadow the impact from other particulate sources in the Rapid City area and prevent representative samples from being obtained. Therefore, this site should not be used to monitor attainment of the air quality standards for the Black Hills-Rapid City AQCR.

The survey of the microinventory area showed an extremely high emission density--1590 ton/sq mi/yr--caused by process emissions and fugitive dust from quarrying and associated operations. Even though the readings from this site are biased for use in determining regional attainment, they do indicate the need for further control of these mineral products industry sources in Rapid City.

3.43 RAPID CITY-SOUTH DAKOTA CEMENT PLANT
SAROAD Site No. 43-1380-004

Description

General site description - The sampler is located on one of the process buildings on the north side of the cement plant, approximately 100 feet above ground level. The immediate area is surrounded by the cement plant property, which is removed from outlying urban/suburban areas.

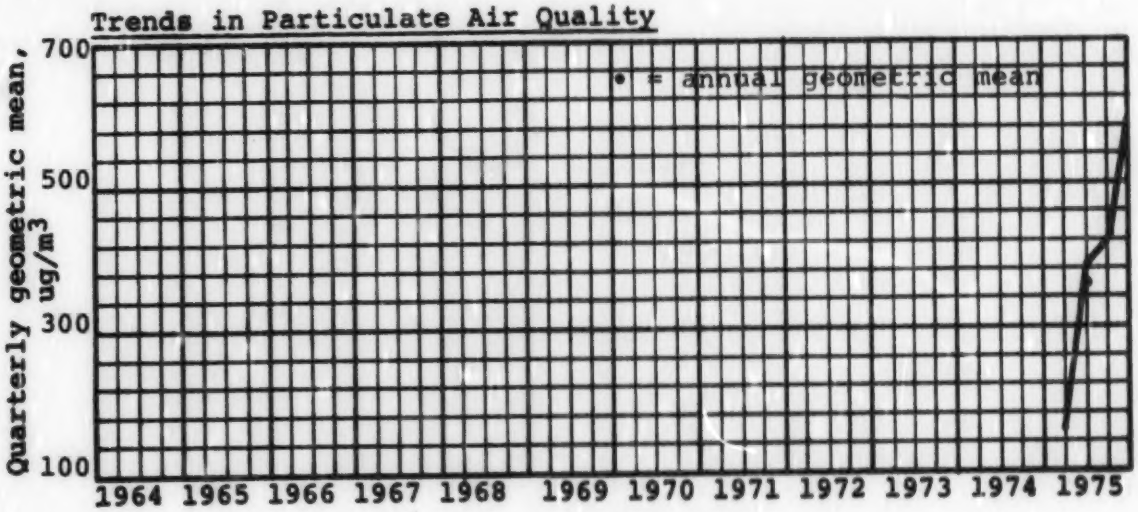
Localized pollution influences - Bordering the immediate sampler area on all sides are various fugitive and point particulate emissions from many operations at the cement plant. There are no major highways in the immediate area, although several do pass through the 1 mile radius area. To the west (1/4 to 1/2 mile) is a large quarrying, sand and gravel, and rock crushing operation owned by Hill's Materials Company and 1/4 mile to the east is the power plant.

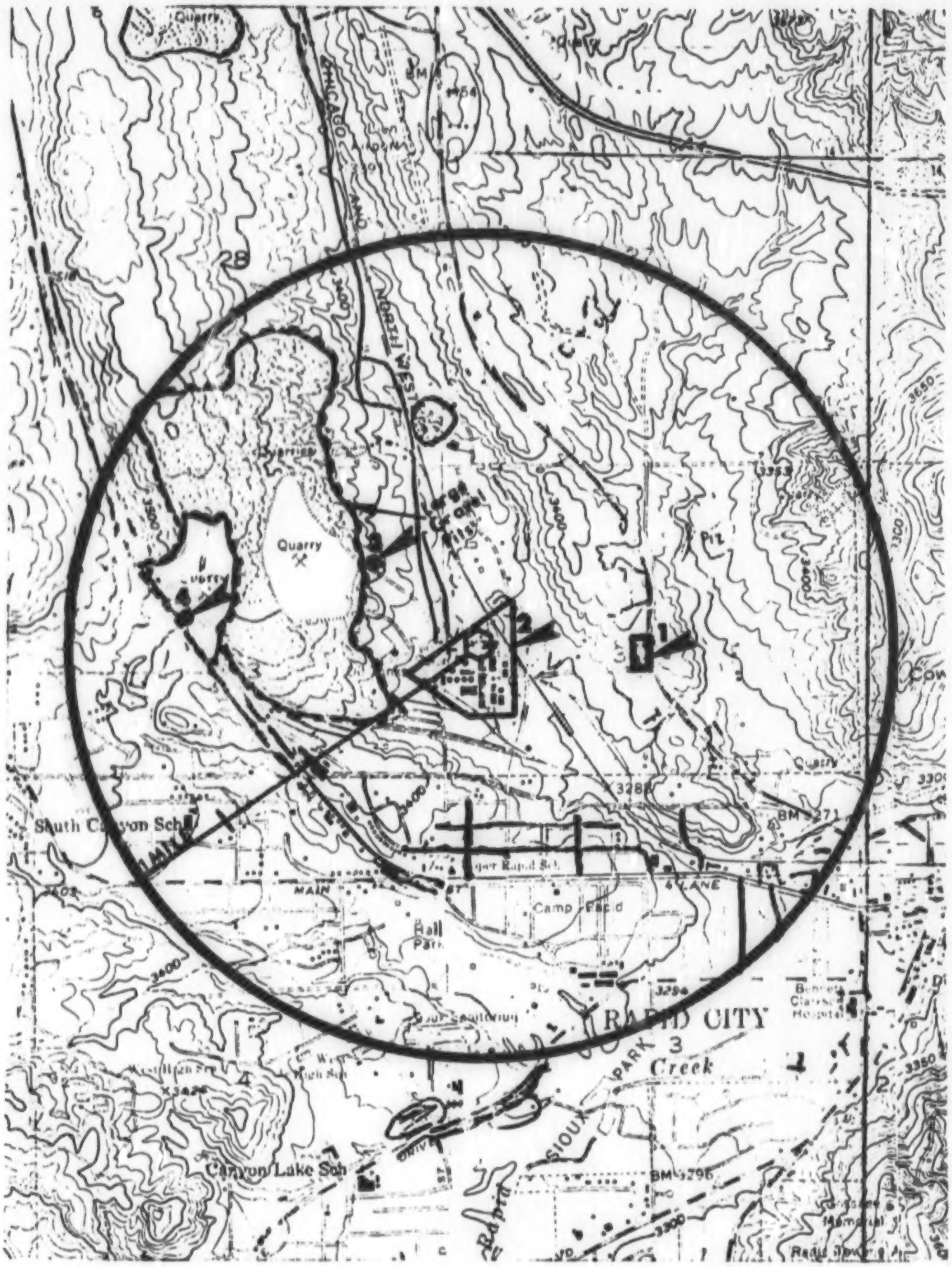
Physical interferences - The building on which the sampler is placed has some protrusions and extensions which could possibly shield the sampler.

Terrain - The immediate site area is flat while the remainder of the area enclosed by the 1 mile radius is characterized by rolling and hilly land. The cement plant sits in a shallow valley.

Comments - It appears that the sampler is clearly providing unrepresentative indications of the ambient air quality in Rapid City due to sampling bias arising from its extreme source-oriented placement.

Trends in Particulate Air Quality




Quarry
28
CHICAGO AND NORTH WESTERN
Quarries
Quarry
Large Gravel Pits
1
2
3
1 MILE
South Canyon Sch
MAIN
4 LANE
Camp Rapid
Ball Park
3288
BM 3271
3353
3650
3300
3350
3400
3294
RAPID CITY
3
PARK
Creek
SIOUX
Rapid
Canyon Lake Sch
BM 3296

Rapid City-South Dakota Cement Plant.

Sources in Microinventory Area (1 mile radius)

Rapid City-South Dakota Cement Plant

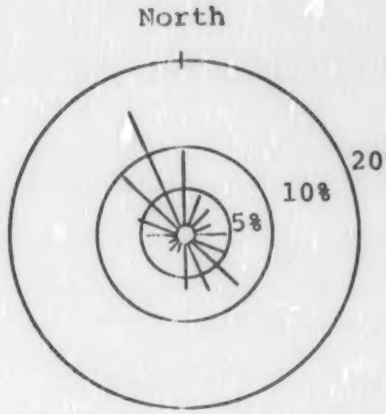
Source category	Size or activity rate	Emission factor	Partic emissions, ton/yr
Point sources:			
1 Black Hills Power & Light			449
Hill's Materials			8
2 South Dakota Cement Plant			221
3 Pete Lien & Sons			2130
4 Hill's Materials			132
Dakota Block			2
James E. Simon			10
Area sources:			
Fuel combustion	From AQMA analysis, apportioned from emission estimates by grid		7
Incineration			1
All mobile sources			4
Fugitive dust sources:			
Unpaved roads	8.7 mi, 21 ADT	4.0 lb/VMT	133
Unpaved shoulders	2.5 mi, 6.1 ac	0.3 t/ac/yr	2
Paved roads	9000 VMT/day	0.04 lb/VMT	66
Road sanding	9000 VMT/day	0.003 lb/VMT	5
Unpaved parking lots	5 ac	0.29 t/ac/yr	1
Construction	2 ac	6.4 t/ac/mo	13
Cleared areas	22 ac	0.26 t/ac/yr	6
RR right-of-way	3.8 mi, 18.4 ac	0.3 t/ac/yr	6
Gravel pits/quarries	260 ac	9.4 t/ac/yr	2444
Total emissions, ton/yr			5640
Emission density, ton/sq mi/yr			1796
Percent fugitive dust			47

Meteorological Data

Average annual
wind speed = 11.0 mph

Annual precipitation
1974 = 9.12"
1975 = 17.46"
Normal = 17.12"

No. of days
with precipitation = 100



Rapid City Airport - 5.2% calm

Maximum Recorded Concentrations

1975 = 1530 ug/m^3

Summary and Conclusions

The State Cement Plant site was started in early 1975 and recorded an annual geometric mean of 364 ug/m^3 for that year. The sampler is located on the roof of a process building at the plant, surrounded by stack emissions and fugitive dust sources. Due to the bias imposed by the proximity of the sampler to these major sources, this site should definitely not be used in assessing the attainment status of the Black Hills-Rapid City AQCR.

This site is located only 0.7 mile from the Ken Freize Enterprises site. There is a definite need for a particulate sampler in the northwest quadrant of Rapid City, but it should be located without the source-specific orientation of the two present sites. It is likely that a well located sampler would show ambient levels above the standards in this area.

The microinventory survey area had an extremely high emission density of 1796 ton/sq mi/yr from the cement plant and surrounding quarrying and processing operations. As with the Ken Freize site (which encompasses much of the same survey area), the high particulate concentrations and emission density do indicate the need for further control of the mineral products industry sources.

4.0 SUMMARY

4.1 REASONS FOR NON-ATTAINMENT IN REGION VIII

The specific reasons for particulate concentrations above the standards at each of 43 sites in Region VIII states are summarized in Table 4-1. The reasons generally fell into one of three categories--excessive impact from point sources (out of compliance with existing state regulations), excessive impact from fugitive dust sources, or bias in the readings caused by location of the sampler too close to a low-level emission source. In addition, 14 of the sites investigated were judged to have attained the primary standards based on recently available air quality data for 1975. It is important to consider that those sites may or may not continue to demonstrate attainment based on currently unavailable air quality data for 1976. One site (Libby, Montana) had inadequate sampling data to determine whether the standards were being exceeded. Four sites in Colorado (Englewood, Steamboat Springs, Rifle, and Grand Junction) have concentrations above the primary standards, but the reason(s) for the high readings could not be identified from the site surveys.

Another potential reason for high readings would be incorrect filter handling, sampler operation, or laboratory analysis procedures. Agency personnel responsible for air quality data and field operators were interviewed to determine the adequacy of their present procedures. The questionnaires shown in Appendix A were completed in each state. However, it was beyond the scope of this project to personally monitor the individual steps to confirm that acceptable procedures were being followed. The interviews did not reveal any problems with sample handling or analysis that

Table 4-1. EPA REGION VIII NON-ATTAINMENT SUMMARY

AQCR/Site	Reason for non-attainment					
	Pt source impact	Fugitive dust impact	Site bias	Cannot explain	Has attained[a]	Inadequate a.q. data
Denver						
Adams City		x				
Arvada			x			
Aurora					x	
Brighton	x	x				
School Admin.		x				
CAMP		x				
Gates Rubber		x				
Wastewater Plant		x				
C.A.R.I.H.		x				
Englewood				x		
Lakewood					x	
Littleton					x	
Longmont	x	x				
Pawnee						
Greeley - City					x	
Greeley - Ttmt. Plt.		x	x			
Loveland					x	
Sterling					x	
Windsor			x		x	
La Salle			x			
Platteville		x	x			
San Isabel						
Colorado Springs		x				
Pueblo Fire Stn.	x					
Pueblo Health Dept.	x	x				
Trinidad					x	
Walsenburg					x	
Yampa						
Steamboat Springs				x		

[a] based on 1975 air quality data.

Table 4-1 (continued). EPA REGION VIII NON-ATTAINMENT SUMMARY

AQCR/Site	Reason for non-attainment					
	Pt source impact	Fugitive dust impact	Site bias	Cannot explain	Has^a attained	Inadequate a.q. data
Grand Mesa						
Rifle				x		
Grand Junction				x		
Tract CB 020					x	
Tract CB 022					x	
Great Falls						
Great Falls					x	
Helena						
Butte - Greeley School	x	x	x			
Missoula						
Missoula Cthse.					x	
Libby	x					x
Wasatch Front						
Magna					x	
Ogden		x				
Provo	x	x				
Salt Lake City		x				
S.L.C. Airport		x				
Wyoming						
Rock Springs		x				
Black Hills						
Ken Freize	x		x			
Cement Plant	x		x			
Health Dept.	x	x				

[a] based on 1975 air quality data.

could cause high readings. All of the agencies routinely void data for damaged filters and recheck data handling and analytical steps for high reported values. It was originally planned to discuss quality assurance aspects of the data for each site, but no problems worthy of note (which might contribute to the indicated non-attainment) were identified at any of the sites.

The percentage of sampling sites in a regional sampling network that are reading concentrations above the primary standards provides an indication of the extent of the non-attainment problem in an AQCR. The total numbers of high volume samplers operating in 1975 in each AQCR are summarized below:

AQCR	Preliminary no. of n.a. sites	Confirmed no. of n.a. sites	Total network sites
Denver	13	10	22
Pawnee	7	3	11
San Isabel	5	3	8
Yampa	1	1	7
Grand Mesa	2	2	15
Great Falls	1	0	3
Helena	1	1	7
Missoula	2	0	7
Wasatch Front	5	4	13
Wyoming	1	1	10
Black Hills	3	3	7
Total	41	28	110

In general, the sources associated with non-attainment areas in the large urban centers of Region VIII such as Denver, Salt Lake City and Colorado Springs were traffic related (reentrained dust from streets, winter road sanding, and motor vehicle exhaust). In some moderate sized cities such as Grand Junction and Rapid City, traffic related emissions also appeared to be a major cause of non-attainment. However, in most of the medium and small cities, the major sources were point sources, unpaved roads, construction, and/or windblown dust from agricultural and open areas. None of the non-attainment sites were in rural locations. Point sources were major contributors to high readings at 10 of the 28 sites which currently have annual mean concentrations above 75 ug/m^3.

4.2 NEED FOR IMPLEMENTATION PLAN (SIP) REVISIONS

In most of the AQCR's, attainment will require emission reductions from fugitive dust sources. Where the fugitive dust sources are traffic related, possible control measures include improved street cleaning, control of material deposition on street surfaces, and traffic controls. These are probably new areas of regulation for the state agencies and may require innovative approaches such as administrative agreements with local governments specifying minimum street cleaning schedules. EPA's Office of Air Quality Planning and Standards is currently preparing a guidelines document for use by states in evaluating potential measures to reduce dust emissions from streets.

Most SIP's already have some regulation, such as a nuisance provision or fenceline opacity restriction, for control of general fugitive dust sources. However, with the exception of the Colorado regulation, more enforceable provisions will probably be needed in the SIP's for control of such sources as construction sites and unpaved roads. In the Pawnee, Yampa, and Grand Mesa AQCR's in Colorado, more comprehensive enforcement programs for the state's existing regulations appear to be a preferable approach to the addition of more regulations in the SIP. For some of the sites with large contributions from fugitive dust sources, reasonably available control techniques may not provide the needed emission reductions.

Most of the sites with major point source impact are affected by one or two very large sources rather than a group of diverse sources. While there was usually no information in state agency files to indicate that these sources were not in compliance, the magnitude of emission estimates makes it doubtful that they are in full compliance. Thus, it is difficult to assess whether an SIP revision or a compliance schedule under existing regulations is required.

Of the 11 AQCR's investigated, it appears that new strategies for attainment of particulate standards and/or implementation of existing controls will definitely be required for six AQCR's in five different states:

Denver
San Isabel
Helena
Wasatch Front
Wyoming
Black Hills

Three of the AQCR's in Colorado--Pawnee, Yampa, and Grand Mesa--have ill-defined problems and may be able to utilize existing fugitive dust regulations in the SIP to bring about necessary emission reductions. Two AQCR's in Montana--Great Falls and Missoula--had significant improvements in air quality in 1975 and appear to have attained the standards.

4.3 OBSERVATIONS ON AIR QUALITY DATA

In analyzing the air quality data during this study, several important observations were made relative to the question of determining attainment of air quality standards. These are discussed briefly below.

In Colorado, seven of the non-attainment sites outside the Denver metropolitan area were relocated during 1974. These moves, most of them only a few blocks, resulted in four of the sites (Loveland, Windsor,* Trinidad, and Walsenburg) having annual geometric means lower than 75 ug/m^3 in 1975. However, there was no evidence that the samplers were relocated into areas with lower emission densities (the sites were usually only moved a few blocks, which would not affect their exposure on a regional scale). It is assumed that the samplers were moved because of site biases which were identified or for operational or maintenace reasons. In all seven cases, the new site locations are in areas where high particulate concentrations for the respective cities would be expected.

Almost all of the sites had lower concentrations in 1975 than in 1974, as shown in Figure 4-1. One explanation for this, given the high incidence of fugitive dust emissions in these areas, is that 1974 was a very dry year and/or that 1975 had higher than normal amounts of precipitation. Large yearly variations in air quality as a function of weather conditions could present a problem if 1975 was an extreme year--areas which apparently attained the standard would again have concentrations above the standard in subsequent years with a return to average weather conditions. In order to evaluate the possible effect of precipitation on 1974 and 1975 particulate concentrations, the precipitation data for these two years at the 11 weather

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* moved in late 1973

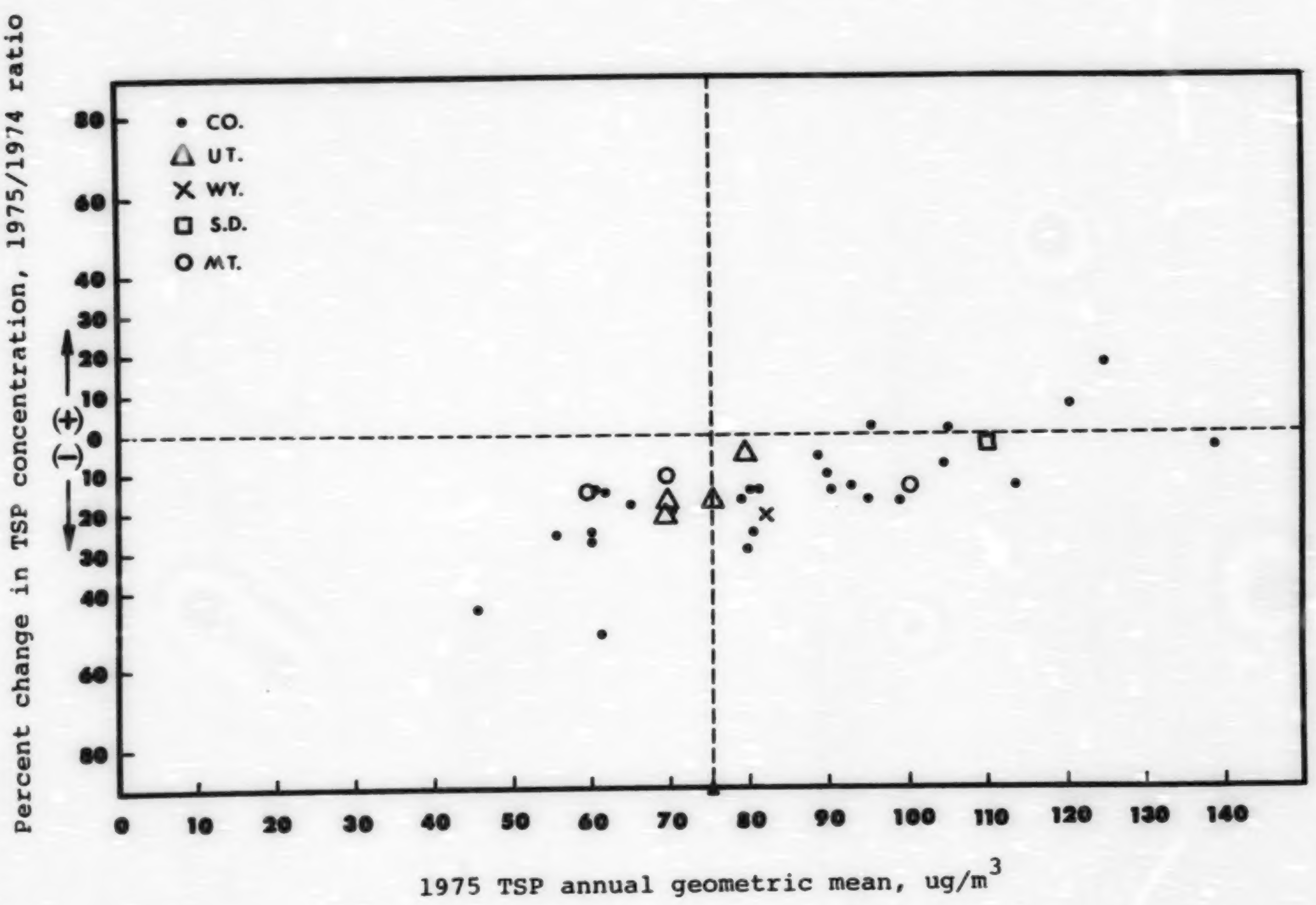

Figure 4-1. Relative change in measured TSP concentration for Region VIII sites, 1974 to 1975.

stations used in this study (see the fifth pages of the site evaluation packages) were compared with the 30 year averages for annual precipitation at the same stations. In 1974, six of the stations had less than average precipitation and five had about average; in 1975, three had less than average, four had an average amount, and four had more than average precipitation. Therefore, it can be concluded that 1974 was a dry year and that 1975 was fairly typical for the Region VIII states as a group.

Although they weren't evaluated for their possible impacts, other explanations for the decrease in concentrations from 1974 to 1975 may be a greater than normal decrease in overall average wind speeds or the distribution of precipitation during the year.

Several of the sites had maximum 24-hour readings above 500 ug/m^3. Such a high reading increases the annual arithmetic mean by more than 7 ug/m^3 (assuming 60 samples and an annual arithmetic mean of 80 ug/m^3). However, it should be pointed out that the geometric mean on which the air quality standard is based is not nearly as sensitive to these extremely high values. A single reading of 500 ug/m^3 only increases the annual geometric mean for the same data set by 2.5 ug/m^3. Therefore, these occasional very high concentrations are violations of the short-term standard but do not have an inordinate effect on attainment of the annual standard.

There does not appear to be a general pattern for peak concentrations relative to annual average concentrations. A few sites exceed only the 24-hour or annual standard, but most exceed both or have attained both. The maximum and second highest concentrations are much more variable from year to year than the geometric mean and are therefore more difficult to use in assessing the magnitude of the standards' violations. Also, the observed maximum values for a site are a function of the sampling frequency, as shown very clearly by comparing the NASN data (every sixth day) and State data (every day) obtained concurrently at the Salt Lake City and Ogden sites.

4.4 RELATIONSHIP BETWEEN EMISSION DENSITIES AND AIR QUALITY

Estimated emission densities were plotted as a function of 1975 annual geometric means for all of the sites except those shown in Table 4-1 to have siting biases. Linear regression analysis of these 32 data points (Tract CB 020 and 022 were also eliminated due to lack of air quality data) gave a line of best fit with a slope of 16.92, an intercept on the ambient concentration axis of 63.5 ug/m^3, and a correlation coefficient of 0.57, as shown in Figure 4-2. These data thus exhibited a poor to fair linear relationship, but the slope and intercept were both somewhat higher than had been observed in other similar studies. When data in Kansas City, Wyoming, South Dakota, Las Vegas, and Reno were tested separately for relationships between emission density and air quality, the range of slopes was 6.1 to 8.3 and the range of intercepts was 16 to 38 ug/m^3. It was hypothesized that the intercept value (zero emission density) provided a good estimate of the particulate background concentration in an area.

The high values for slope and intercept obtained in the present case could be attributed to either of two reasons: (1) the sites are in several different geographic and climatic areas with widely varying backgrounds, causing scatter in the resulting combined data set; or (2) all of these sites are non-attainment sites, indicating that their air quality values are mainly bunched in the range of 75 to 125 ug/m^3 and therefore do not have as well defined line of best

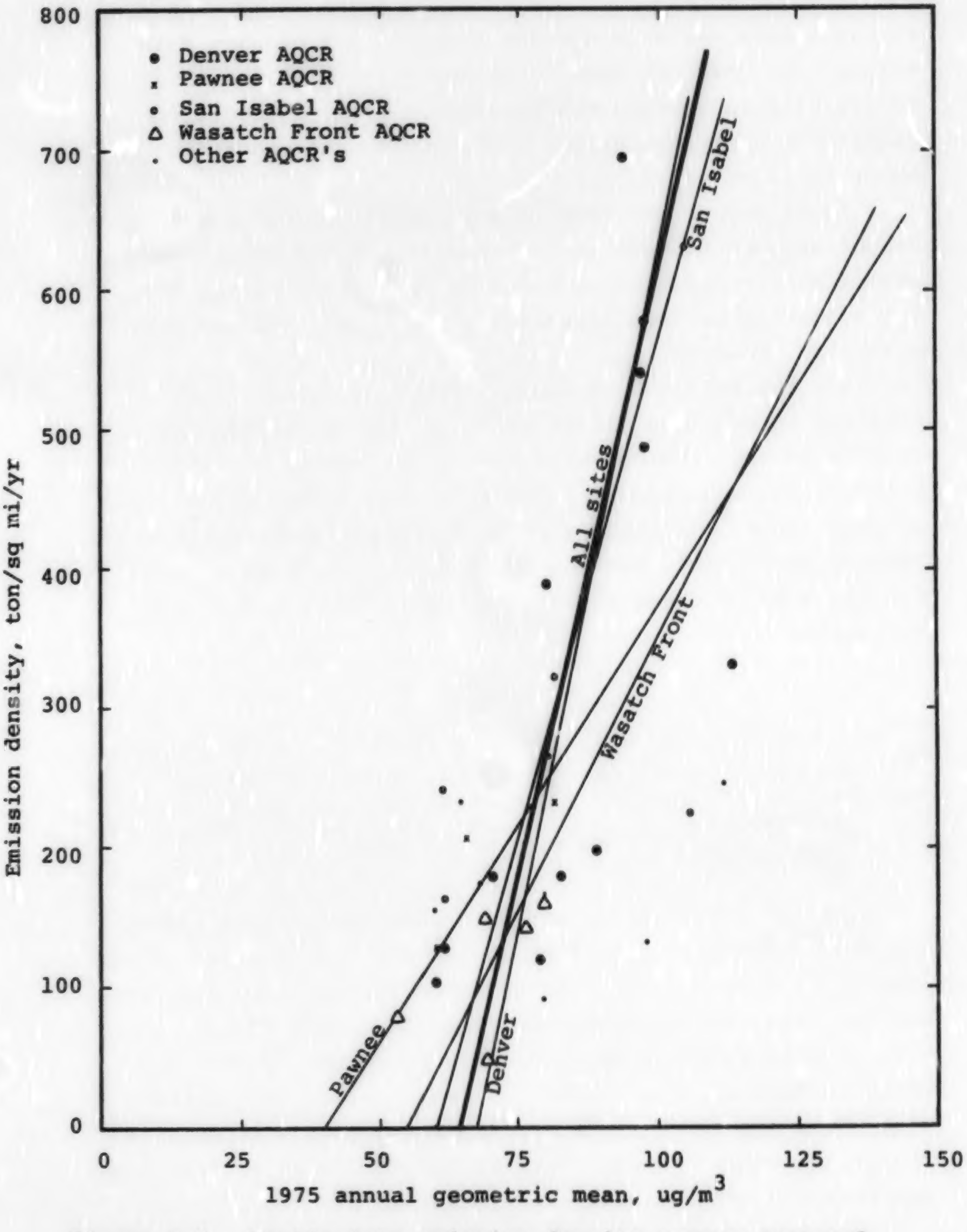

Figure 4-2. Particulate emission density versus measured air quality.

fit as a data set with a wider range of air quality data values. It does not seem to be appropriate to use this line to estimate background concentrations or to estimate the emission density equivalent to an ambient concentration of about 75 ug/m^3.

It is recognized that linear regression and correlation do not account for all the variability in a data set and that a more sophisticated model may provide a better fit. Investigation of this possibility was beyond the scope of this work, however.

For the AQCR's with several sampling sites, it is possible to plot individual emission density versus air quality curves, thereby eliminating the possible problem of widely varying background concentrations in different geographic areas. The AQCR's with multiple sites are Denver, Pawnee, San Isabel, and Wasatch Front. The lines of best fit for each of these areas are shown in Figure 4-2 and summarized below:

AQCR	Data points	Slope	Intercept	r
Denver	12	19.61	68.0	0.67
Pawnee	3	6.25	39.4	0.80
San Isabel	5	14.08	59.7	0.60
Wasatch Front	5	7.81	54.5	0.63

The individual AQCR data sets show good correlations, but still have high indicated background levels. Two of the areas have slopes similar to that for the combined data set and the other two have slopes within the range of the previously reported studies. In all four of the AQCR's, an emission density of about 200 ton/sq mi/yr is associated with the air quality of 75 ug/m^3. This is consistent with the relationships in other states and AQCR's where this same analysis was carried out.

APPENDIX A

SITE DESCRIPTION AND QUALITY ASSURANCE FORMS

Date ________
By ________

Site Description: ____________________
____

Site No.: ____________

1. Land use of general surroundings:

2. Sampler location:

3. Localized pollution influences:

4. Physical interferences:

5. Terrain features:

6. Estimate of background concentration: ____________

7. Significance or representativeness of site:

8. Photographs taken: ____________________________

QUALITY ASSURANCE - PN 3155-DD

1. Do filters meet recommended specifications?

   a. 99% collection of particles 0.3 u m?

   b. pH between 6.5 and 7.5?

2. Are the filters inspected visually?

3. How are the filters marked?

4. Are filters equilibrated before weighing?

5. How often is the analytical balance calibrated?

   a. by what method?

   b. is the calibration date recorded?

   c. is the balance accurate to ± .5 mg?

6. Is the filter serial number recorded along with its weight?

7. How is the filter packaged for shipping?

8. Are the filters installed correctly?

9. Are before and after sample flow rate measurements taken?

   a. how often is the hi-vol calibrated?

b. by what method?

c. is the normal hi-vol flow rate between 40-60 cfm?

d. how often is the elapsed time meter checked?

e. what met parameters are recorded for each sample?

f. what information is recorded in each hi-vol log book?

10. How is the filter packaged for transport?

11. What remarks are included on sample folder?

12. What verification procedure is used for the samples?

13. How are the values reported? To whom?

Comments:

14. Are the current procedures associated with sample collection, transfer, validation, and reporting adequate? If not, why not?

Agency: ____________________

Contact: ____________________

Date: ____________________

Signature: ____________________

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3. Analysis of Probable Particulate Non-Attainment in the Kansas City AQCR. PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio. Prepared for U.S. Environmental Protection Agency. February 1976.